

OCTOBER, 1955

METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

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Silver Plating Aluminum Bus Bars

Production of Low Contact Resistance at Joints

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Characteristics of Various Tri-Alloy Deposits

**Surface Treatment and Finishing of
Light Metals**

Anodizing with Chromic, Sulfuric and Oxalic Acids

Getting the Most Out of Centrifugal Pumps

Pointers on Installation and Operation

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Complete Contents Page 41



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Clepo-Phos

CLEPO 196
CLEPO 196-F

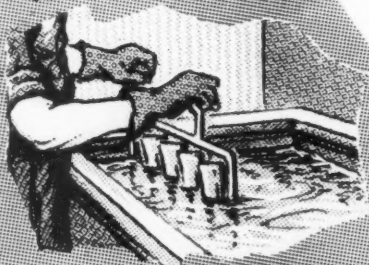
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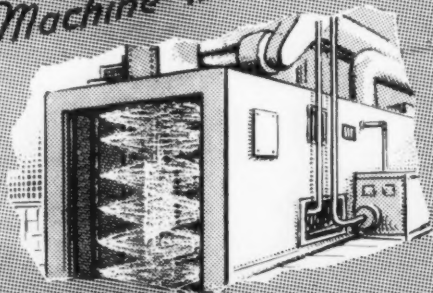
Clepo 196 for Tank Dipping

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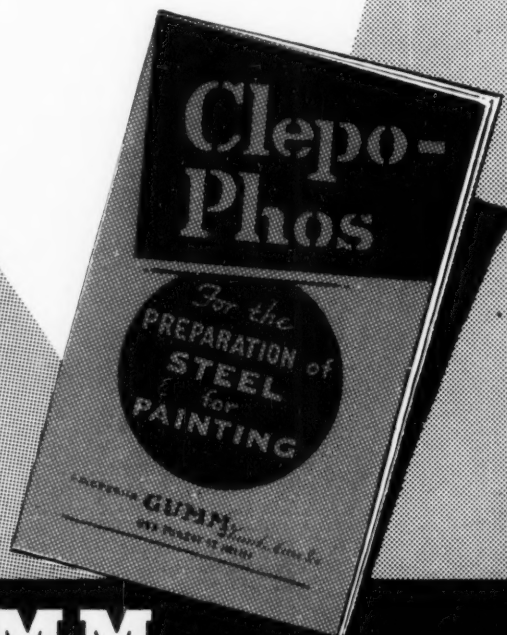
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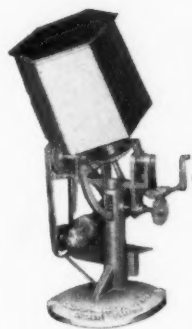
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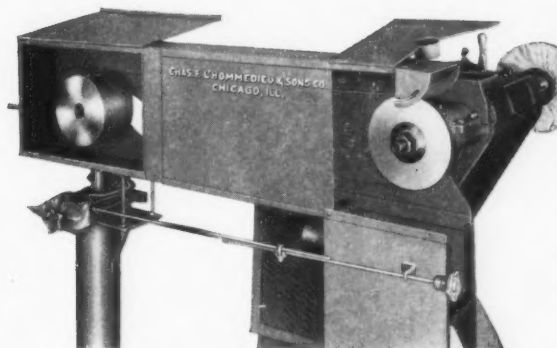
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This is a plain Ruff-L-Buff after wearing off about one inch in testing operations and then trimming. Loose threads, broken material and numerous small holes due to excessive heat and abrasion of the cloth are apparent.



30%

LONGER BUFF LIFE

The Binderized Ruff-L-Buff shown here was subjected to the identical test undergone by the untreated buff — yet look at the difference! Notice the absence of thread or cloth breakage of any kind, proof of Binderizing's effect on buff life.



with New H-VW-M Binderized* Ruff-L-Buffs®

Not just "another type of buff", but a revolutionary new H-VW-M process which impregnates the entire Ruff-L-Buff with the same organic binder used in buffing compounds. From these new "Binderized" Ruff-L-Buffs come a host of practical, cost-cutting advantages, proved over many months in actual production line operations.

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- **Longer buff life** — damage from overheating eliminated by pre-lubrication of buffing material, preventing excess frictional heat caused by constant flexing. This additional buff life has averaged 30% in actual test runs.
- **Better compound adherence** — the binderizing impregnation creates an affinity between buff and compound. The compound does the cutting, not the buff.
- **Faster cutting action** — more compound is retained on the buff, insuring an even cut for a longer period without re-application of compound.
- **Extended composition life** — additional binder in the cloth ensures better abrasive adhesion, longer life of both composition and buff.
- **Heading-up time** — new wheels require only application of the compound to be ready for immediate operation.
- **Cooler running** — in addition to pre-lubrication, six holes in the center and twelve air channels in the center rim provide a forced air circulation over all cloth surfaces.**

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H-VW-M bias-cut Sisalweev buffing wheels are also available in Binderized types.

* Patent Pending
** Patent No. 2,140,208

For complete information on H-VW-M Binderized Ruff-L-Buffs and other specialized buffs write for Bulletin No. B-102.



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This Ransomatic occupies only 90 square feet and will greatly improve the finish of the customer's product, simultaneously effecting substantial savings in labor and floor space.

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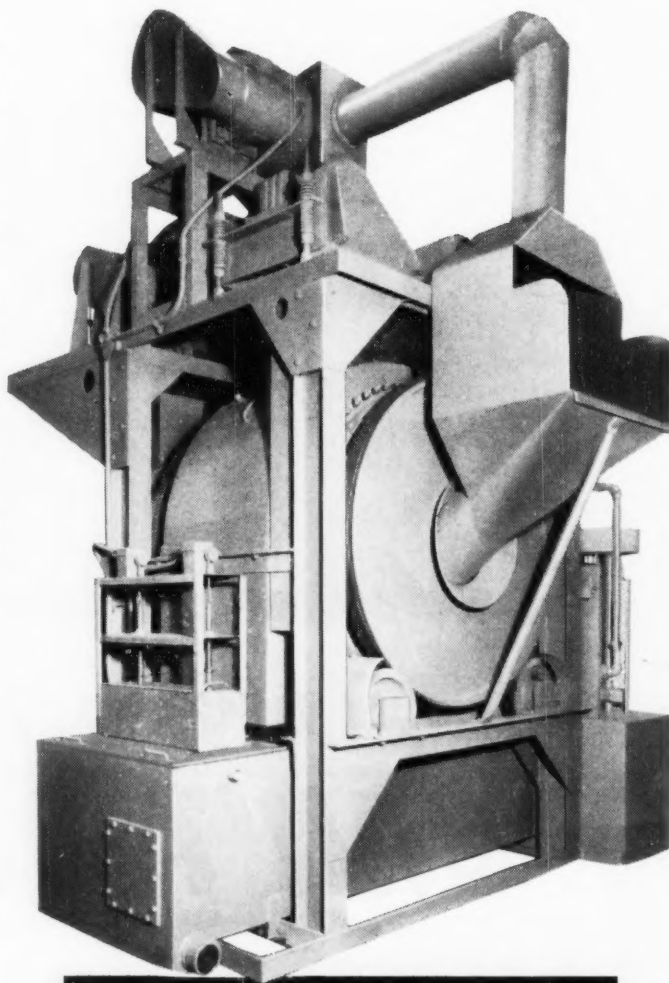
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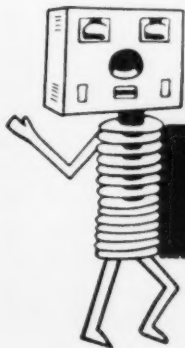
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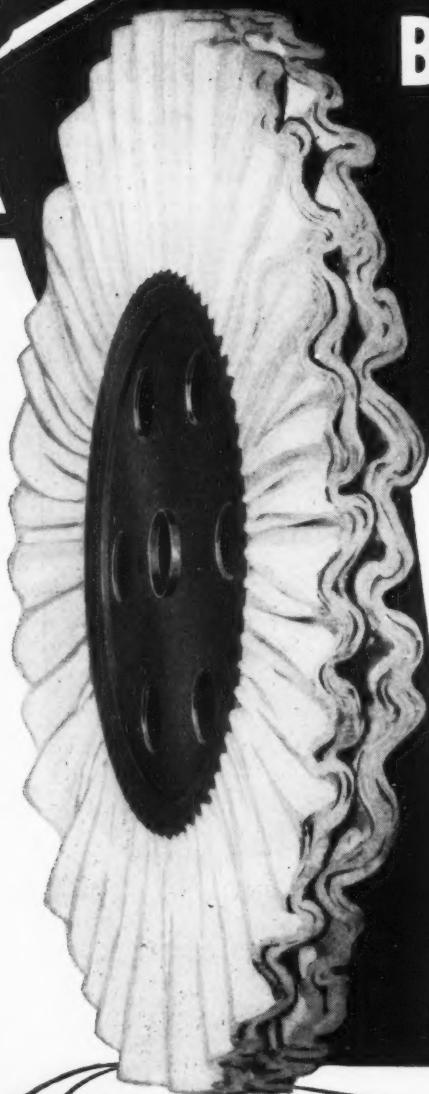
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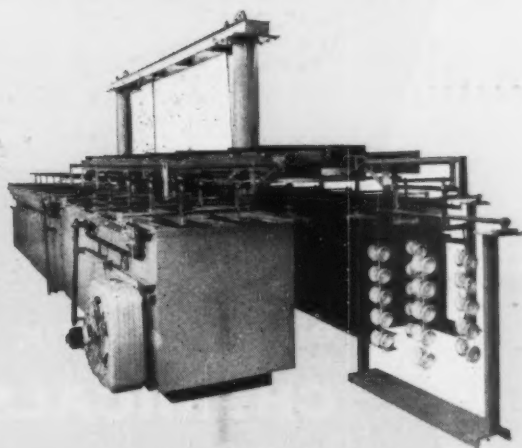
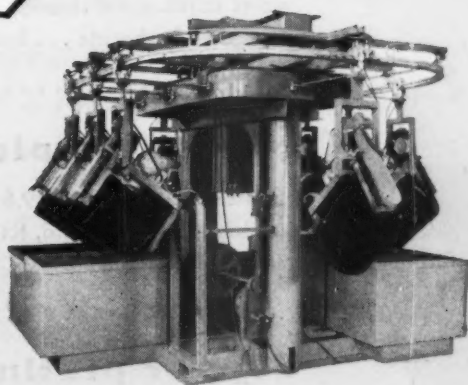
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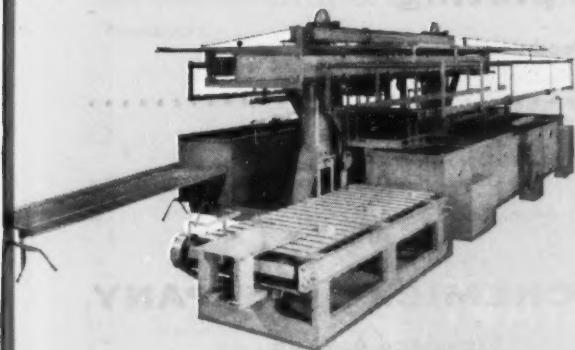
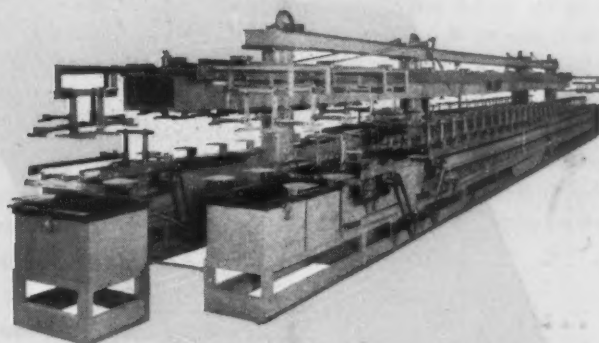
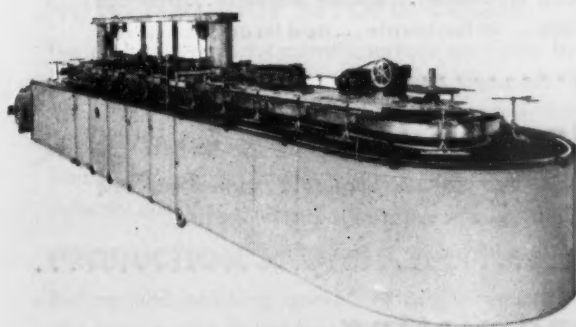
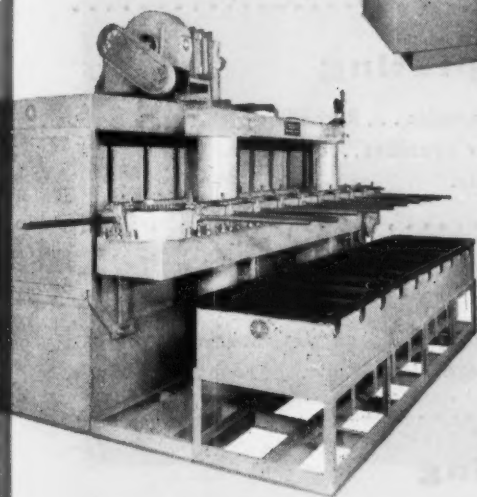
CROWN AUTOMATICS



increase production

reduce costs

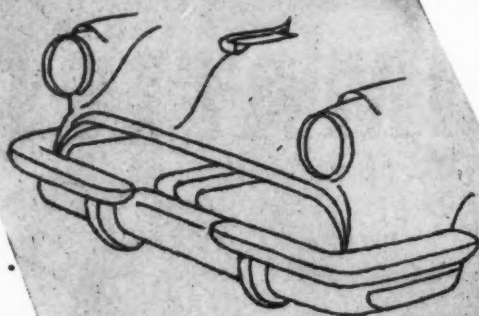
improve quality



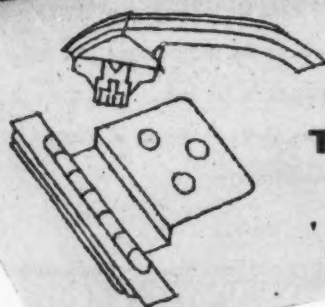
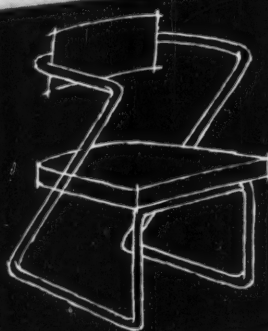
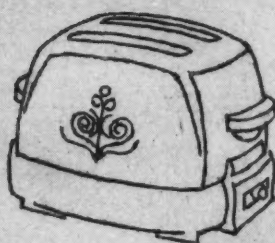
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cadmium plating

... ball and cast cadmium anodes ... cadmium oxide ... sodium cyanide ... cadmium fluoborate.

tin plating

... cast tin anodes ... sodium stannate ... stannous sulfate ... tin fluoborate ... acid tin addition agent.

zinc plating

... ball and cast zinc anodes ... sodium and zinc cyanide ... zinc sulfate ... zinc fluoborate.

lead plating

... cast lead anodes ... lead fluoborate.

silver plating

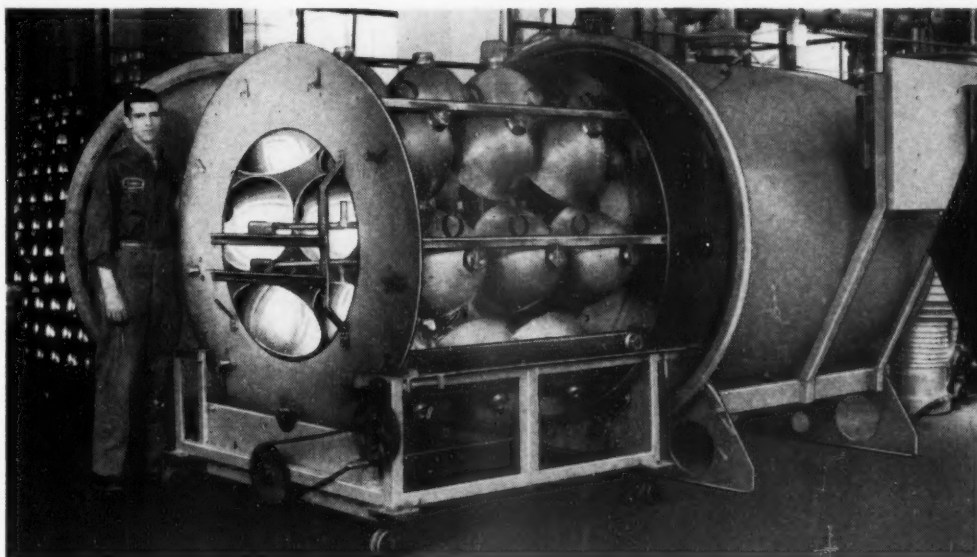
... silver cyanide.

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The gleaming, colorful metallic surface provided by vacuum coating is the answer to competitive demands for color where quality must be maintained, but pennies have to be pinched. Vacuum coating adds a bright shiny finish to metal, plastics and many other materials. The range of colors is virtually unlimited.

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From experience in all phases of vacuum coating, we know that, spectacular as it is, vacuum coating is no cure-all. Tell us what you are processing now, and let us tell you whether you can benefit from this technique. If vacuum coating can help you, we'll supply you with vacuum-coated samples of your own product, in a selection of colors so that you can evaluate them for performance and sales appeal. We'll give you production rates and unit costs for coating your product. Provide a complete system engineered to your requirements. Install it, train your operators and stay on the job until it is operating to your satisfaction.

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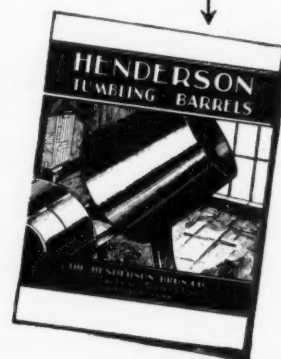
After long experience in the finishing field, we like to recommend cast-iron barrels for most deburring and grinding jobs, but we make rubber, Neoprene, and wood-lined barrels — over 25 types, a barrel for every conceivable finish. Besides the highest quality of material and workmanship, when you buy a Henderson, you get a lot of "know how"!

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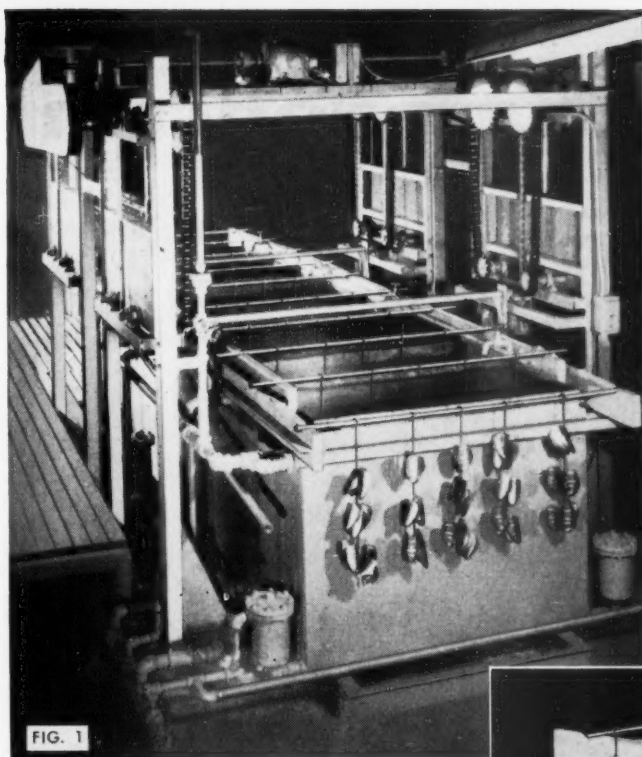


FIG. 1

Fig. 1. Loading End. Loaded racks are hung on rod placed in saddles on transfer frame. At end of each processing period the machine automatically lifts all rods and advances each one tank in the processing cycle.

Fig. 2. Delivery End. Picture shows transfer frame elevated in the transfer operation. When the frame comes down the last rod, which carries parts from the last tank in the processing cycle, will be placed in the unloading saddles on the frame which extends beyond the last tank.

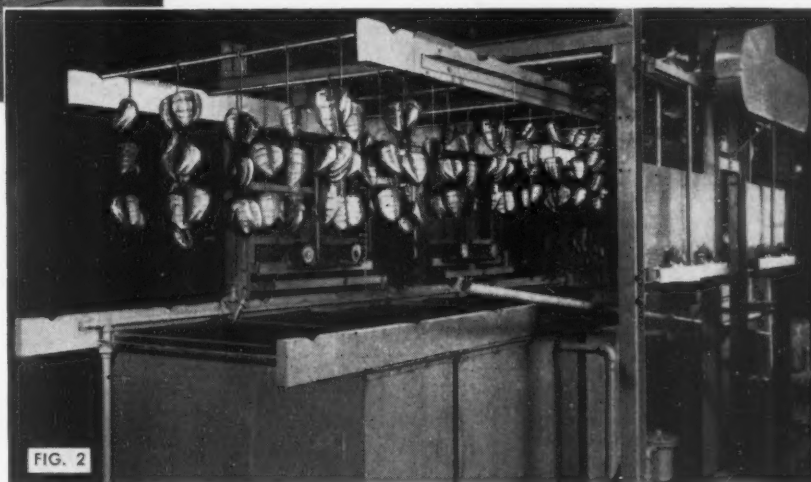


FIG. 2

Features

- Affords practically any required cycle for plating, painting, etching, etc.
- Flexible. Easily adjusted to "skip" tanks for processing articles of different basic metals without changing solution.
- Automatic Timing. Easily set for any processing period from 10 seconds to 20 minutes.
- Uniform Processing. The automatic timer doesn't forget—is not called away. Spoilage is avoided.
- Helps Foreman maintain full production. At a glance he can see partially loaded rods or empty saddles—then locate the cause.
- Available with conveyor-equipped plating tank to which processed work is automatically transferred.

The BELKE Automatic Transfer Machine stops the backaches and high labor costs of processing parts for plating.

The machine automatically lifts and transfers work from tank to tank through the entire pre-plating cycle such as electrocleaning, tepid running rinse, anodic electroclean, cold running rinse, acid bath, cold running rinse, cyanide bath, cold running rinse. Practically any cycle can be had.

The Transfer Unit can be adjusted to "skip" tanks as desired for processing articles of different metals such as steel, brass and die castings. This flexibility makes practical automatic processing of a great range of varied work.

For further labor-saving, a conveyor-equipped plating tank can be furnished with the BELKE Transfer Unit. The Transfer Unit automatically transfers processed work to the conveyor and the work is completely plated while moving through the plating tank.

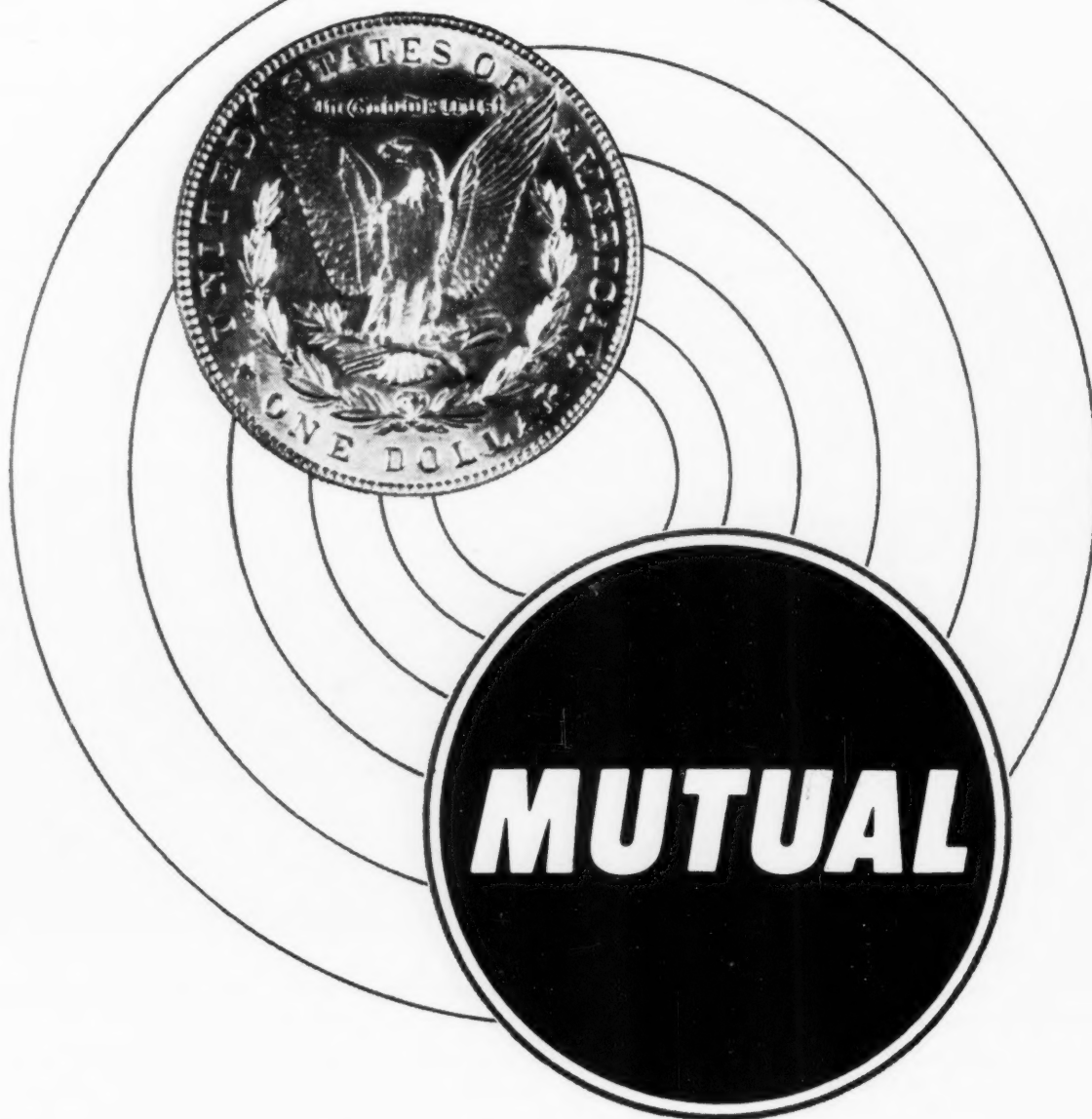
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FINISHING METHOD	FINISH TIME	COST PER DISC	QUALITY	DISCS PER YR.	COST PER YR.	PROD. INCR.	COST SAVINGS
FILE AND WIRE BRUSH	18 HRS.	\$124.92	VARIED	231	\$28,870	—	—
SUPERSHEEN DBF-200 BARREL	4 HRS.	\$ 5.68	UNIFORMLY GOOD	1040	\$ 5,907	450%	\$124,000



HOW AIRCRAFT PARTS FIRM SAVED \$124,000 WITH ONE SUPERSHEEN BARREL

This Almco SUPERSHEEN fixture-type barrel is paying for itself every week.

Compressor rotor discs for jet aircraft must be finished to rigid Air Force specifications at the Le Roy Machine Co., a New York manufacturer of automotive and aircraft parts. Above you see the final inspection of these parts, just barrel finished. Inspected under powerful magnifying glass, critical break-edges of the discs are right down to A. F. specs.

"Supersheen methods were largely responsible for achieving and maintaining the high quality required for aircraft manufacture," reports R. O. Braaten, Le Roy project engineer. Prior to the installation, the rotor discs were deburred by file and wire brush.

Then an Almco finishing engineer recommended that some sample discs be barrel finished . . .

In Almco's Newark laboratory, it was found that deburring these parts required tough, Supersheen bonded abrasive chips, 1/8 in. steel diagonals and abrasive compound to meet strict A. F. requirements and yet get the fastest possible cutting, grinding and polishing action.

That's how the SUPERSHEEN METHOD cut finishing time from 18 to 4 hours per disc, achieving absolutely uniform finish. Too, production was increased 450 percent, saving \$124,000. annually on deburring costs.

Remember, the SUPERSHEEN METHOD is a complete barrel finishing service that begins with an Almco finishing engineer analyzing your specific problem. Then free tests are conducted on your sample parts at the Almco laboratory nearest your plant. The correct media, compounds, barrel rpm, water level and time cycle are determined in order to precision



finish those parts; often a complete test can be run in a matter of hours.

Helping you select the correct size barrel or barrels for your operation is the next step. And whenever you need expert help in finishing problems, ALMCO is at your service. For further information and literature, write, Almco, 104 Marshall St., Albert Lea, Minn.

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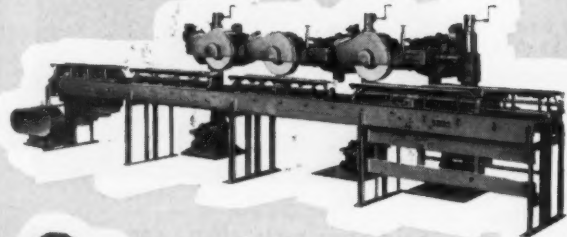
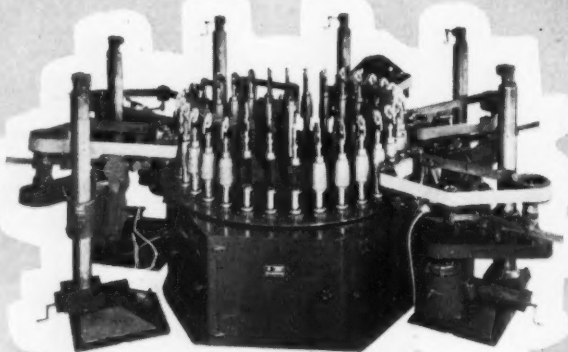
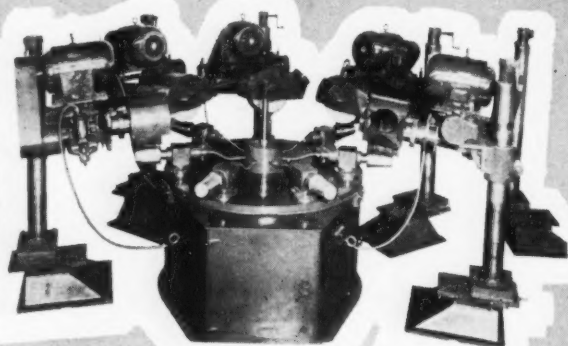
SUPERSHEEN METHOD
FOR
SPEED FINISHING

ALBERT LEA • NEWARK • DETROIT
PHILADELPHIA • NEW HAVEN
LOS ANGELES

ACME *Automatic*

POLISHING *and* BUFFING MACHINES

*are
engineered
for low
cost, high
production
finishing...*



- For Polishing and Buffing, De-burring, Wire Brushing and Micro-finishing
- Rotary *Automatics*
Straightline *Automatics*
Semi-Automatics
- Backed by half a century of specialized experience and progressive development
- Proved performance and dependability in industry

RECOMMENDATIONS and QUOTATIONS

- We will be pleased to receive blue prints or preferably finished and unfinished samples of the part you contemplate finishing together with detailed information on present finishing operation and production requirements. On receipt of samples and data we will offer recommendations and quotations.



ACME Manufacturing Co.

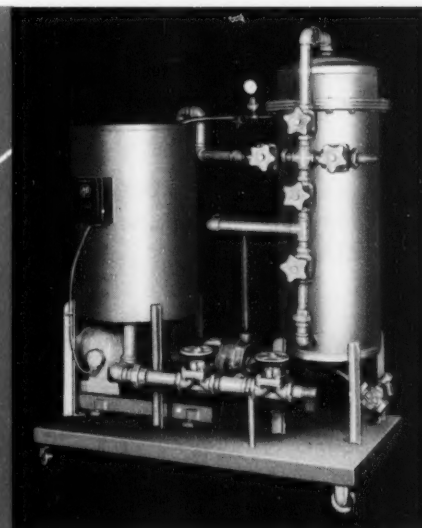
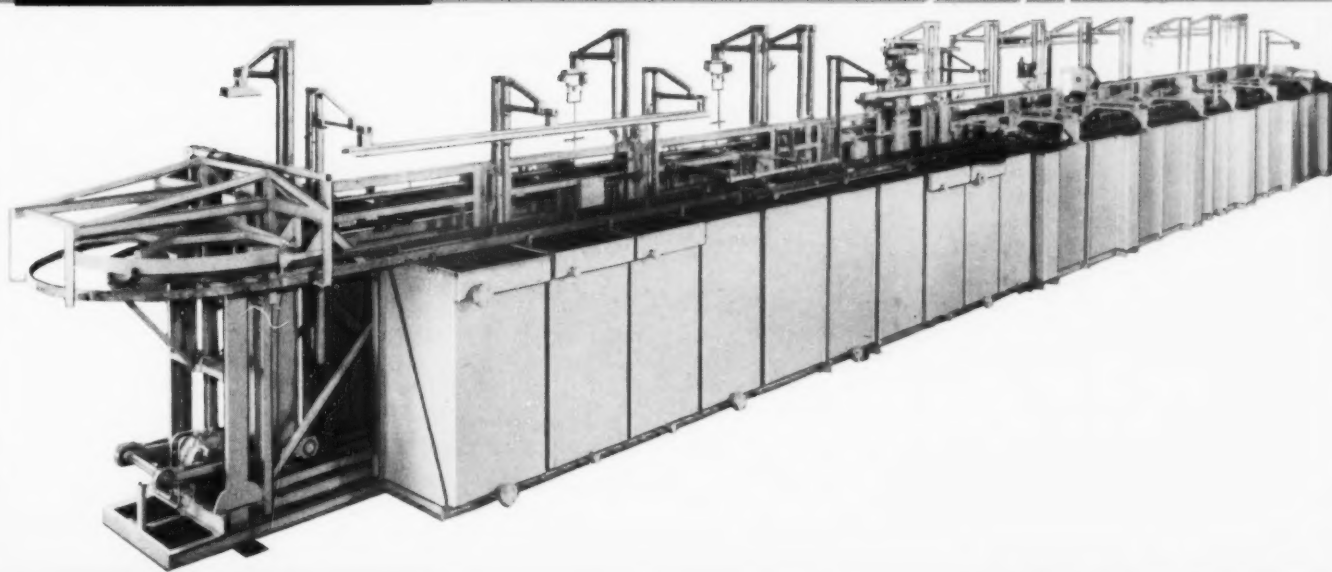
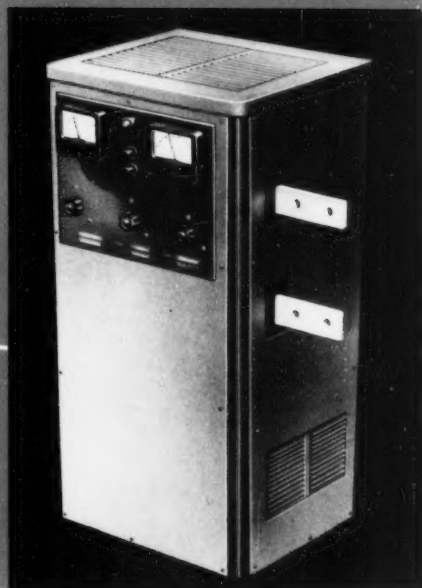
Builders 1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.
OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

CATALOGS ON REQUEST

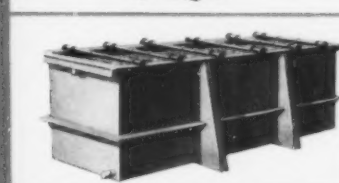
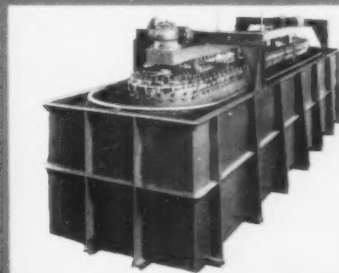
tomorrow's equipment today

WAGNER BROTHERS

automatic plating
equipment and supplies



RECTIFIERS
AUTOMATICS
SEMI-AUTOMATICS
FILTERS
TANKS & LININGS
ANODES
WASTE TREATMENT SYSTEMS

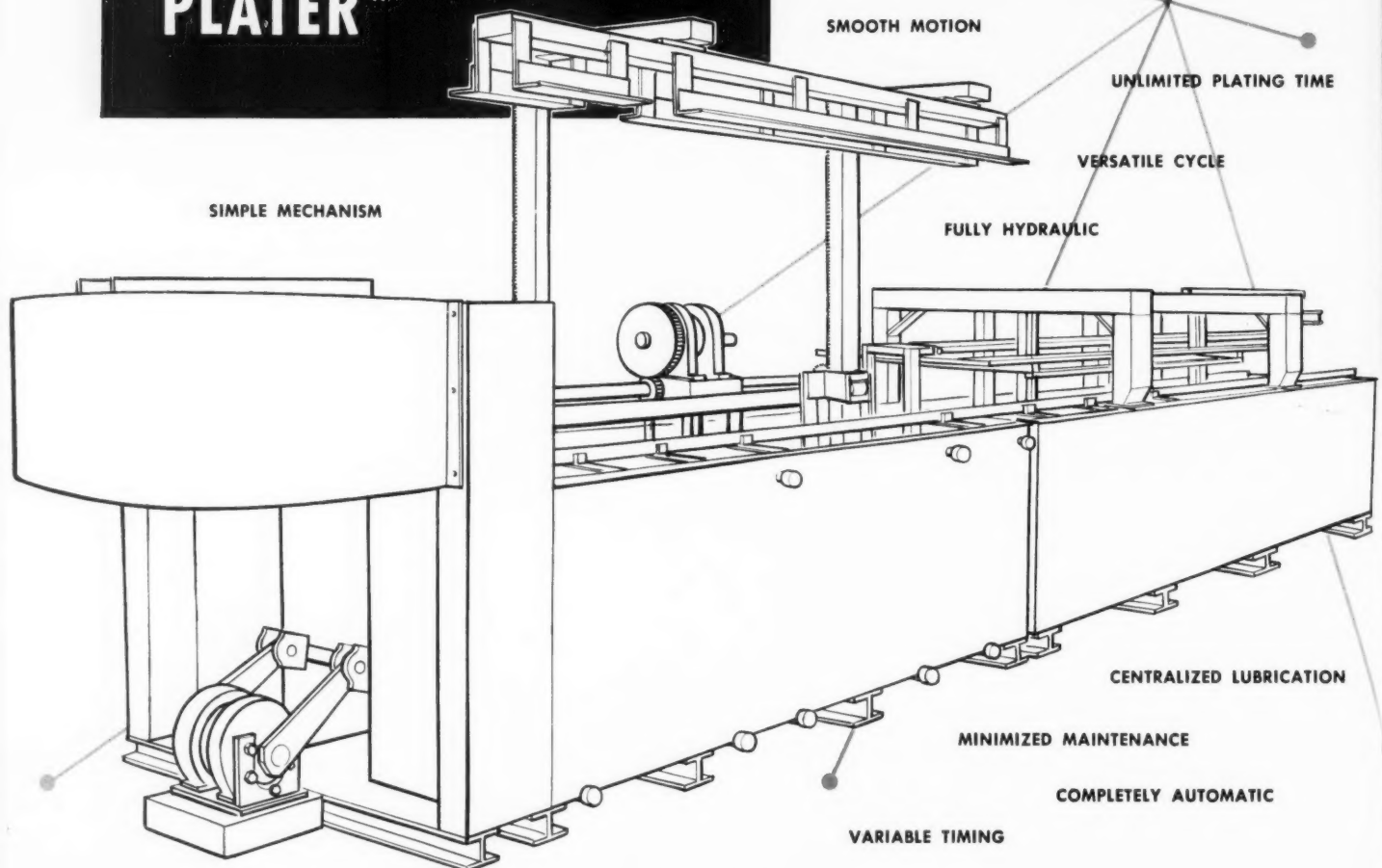


400 MIDLAND AVE. • DETROIT 3, MICHIGAN

Chicago • Rochester • Cleveland • Cincinnati • Indianapolis • New York

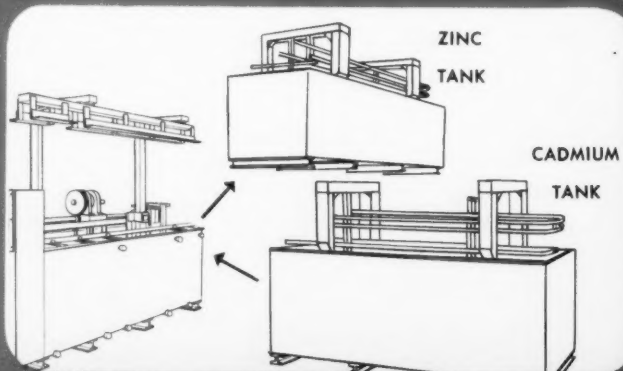
WAGNER BROTHERS NEW STANDARD FULLY AUTOMATIC PLATER*

revolutionary concept in
plating automation now
available to job platers
in a standardized model



Automatic operation benefits you by increased production capacity, lowered unit cost and improved quality control—it's faster, cheaper, better.

The new Wagner Brothers Standard Automatic now offers you, for the first time, an automatic plater with these exclusive advantages:



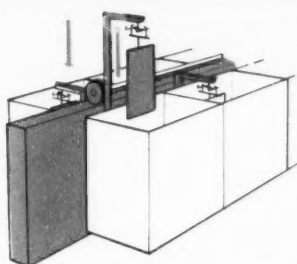
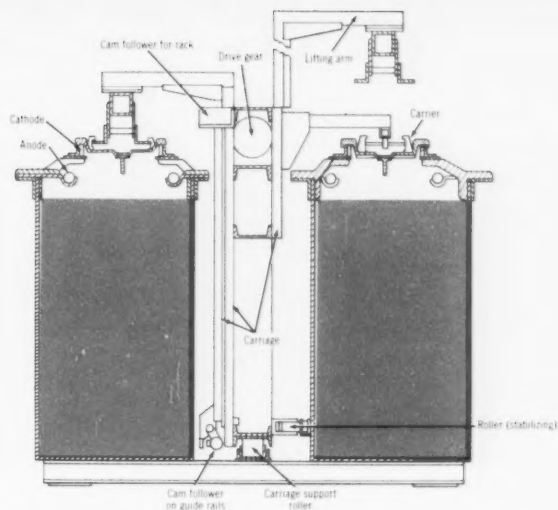
REPLACEABLE PLATING TANK

You can change from plating zinc to cadmium in minutes; the usual time-consuming tank cleaning operations are unnecessary. Just imagine what you'll save in time and materials. Since all conveying rails are built into the plating tank, you simply pull one tank aside and replace it with a spare. This feature gives you all the versatility of having two automatics.

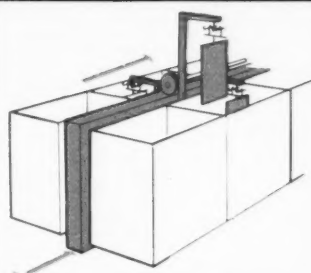
*PATENTS PENDING

SIMPLE TRANSFER MECHANISM

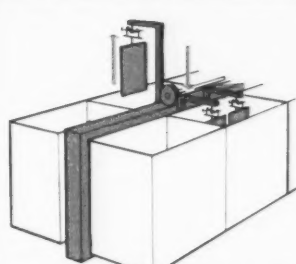
Unique vertical transfer and return type work conveying design efficiently minimizes number of parts, subsequently reduces chances of breakdown. There are no elevating superstructures, transfer cams, chains and sprockets or hydraulic cylinders over tanks. The carriage is motivated by a hydromotor mounted at the base of the machine, fitted with a crank and link to translate the simple harmonic motion of the motor shaft to the in-line reciprocating action of the carriage.



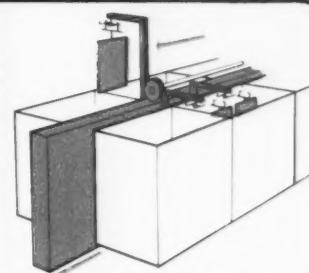
1st VERTICAL MOTION



1st HORIZONTAL MOTION



2nd VERTICAL MOTION



2nd HORIZONTAL MOTION

HOW IT OPERATES — All transfer and conveying mechanism is mounted on a reciprocating carriage located between the two rows of tanks. Two basic motions are used: one forward and reverse horizontal motion of the carriage and a raising and lowering movement of lifting arms attached to the carriage. Plating racks are attached to work carriers at the loading station. When the machine is started, the lifting arms pick up work carriers on one side of the machine, carry them forward to the next station where they are lowered and disengaged. This sequence is simultaneously produced in reverse on the opposite side so that the effect is a balanced work load which requires only low hydraulic pressures.

ELECTRICALLY ISOLATED — The plating tank is a separate unit, electrically isolated from the rest of the mechanism to eliminate possibility of stray currents.

3 POINT CONTACT — The work carrier is designed to give 3 point contact at all times. Constant wiping action on electrified rails keeps contacts clean, assures constant, dependable current flow.

VERSATILE CYCLE — You can have as many as seven stations in both the pre- and post-plating cycle. Tanks are sectionalized at the factory to your particular needs.

SMOOTH PARTS TRANSFER — Our hydromotor power principle *eases* parts through their cycle without jarring them loose from carriers into the tanks.

MINIMIZED MAINTENANCE — All these features vastly minimize maintenance needs: fewer moving parts to wear, no vibration or backlash in automation, no hydraulic cylinders over tanks to contaminate solutions, centralized lubrication, built-in overload protection, working parts easily reached without disassembly, uses only low hydraulic pressures because of balanced work load, and many more.

SIMPLE INSTALLATION — Unit is delivered to your plant intact or in two completely assembled sections. You avoid costly installation.

**WRITE NOW FOR COMPLETE
TECHNICAL DESCRIPTION, QUOTATION**

WAGNER
BROTHERS, INC.

400 MIDLAND • DETROIT 3, MICH.

KROME-ON*

mist-inhibiting
chromium addition agent



really increases *throwing power.*

Industry has spent thousands of dollars and years of research looking for ways to increase throwing power of chromium plating baths—all without significant success. And now, like a bolt from the blue, comes Wagner Brothers' new KROME-ON liquid addition agent which not only gives you throwing power which has *doubled* production and *eliminated* rejects on the plating line, but gives you these other advantages *gratis*:

- Vastly reduced chromic acid waste due to decreased spray, drag-out and flue loss.
- Simplified waste disposal.
- Safe working conditions at reduced ventilating cost.

Unbelievable? Well, hear this documented statement, just one of many in our files!

"We were processing 20 parts per rack through our copper-nickel cycle. We had always averaged 10 rejects at the chrome station, although we could plate 10 parts per rack without rejects, a loss of 50% in production. Then we made KROME-ON additions to the chrome bath. The throwing power was so improved, we consistently ran the full rack of 20 parts without a reject. We never had such performance with any other additive and we saved the cost of mist-inhibitors usually required." (Name of company supplied upon request.)

KROME-ON will not alter the sulfate radical content of your chrome bath, thus will not change the chosen ratio. An excess of KROME-ON will not impair operating characteristics.

Let our service representative demonstrate the obvious advantages of new KROME-ON. Technical data, prices available upon request. *Call or write now!*

*Pats. Pending

WAGNER BROTHERS, INC.

400 MIDLAND • DETROIT 3, MICH.

CHICAGO • ROCHESTER • CLEVELAND

CINCINNATI • INDIANAPOLIS • NEW YORK

Please forward full details on the new KROME-ON mist-inhibiting addition agent to:

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

NEW!

Four Of A Kind For Better Barrel-Finishing. The new Norton Tumblex "T" abrasive brings you an unbeatable combination for top performance: non-wedging triangular shape; fast-cutting bonded ALUNDUM* abrasive; and four sizes for the widest range of applications.

Brand new! . . . Norton TUMBLEX "T" **— bonded, triangular shape tumbling abrasive**

*Users report Tumblex "T" abrasive brings many new
"TOUCH of GOLD" benefits to barrel-finishing*

Here's one of the most revolutionary barrel-finishing innovations ever developed. In typical on-the-job tests, Norton customers report that the new Tumblex "T" tumbling abrasive:

- **"cuts tumbling cycle time from five hours to one hour."**
- **"finishes steel and magnesium parts that could never before be barrel-finished."**
- **"completely removes burrs from stainless steel parts in four hours. Abrasives previously used failed to do so in 12 hours."**

Everything about Tumblex "T" abrasive is designed for better barrel-finishing.

Its uniform triangular shape and size prevents wedging in recesses of parts.

Made of famous Norton ALUNDUM abrasive, it cuts fast, with no compound needed — resulting in shorter time

cycles and lower costs per piece finished.

It provides maximum surface contact with parts being processed, assuring top quality work in fastest time.

It wears down evenly, keeping the same triangular shape. No small chips to lodge in holes, slots, etc. — and when worn down it can be used on parts requiring a smaller size abrasive.

Its lightness means less weight required to fill the barrel. Results are more uniform finish, without roll-in or roll-over of edges of parts.

Its chemical inertness, unaffected by acids, compounds or detergents, prevents spoilage common to other types of abrasive.

Send Your Work Samples

to our newly enlarged Sample Processing Department. Let us prove to you how the latest barrel-finishing equipment and techniques can improve your product

quality and cut your finishing time and costs. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

G-294

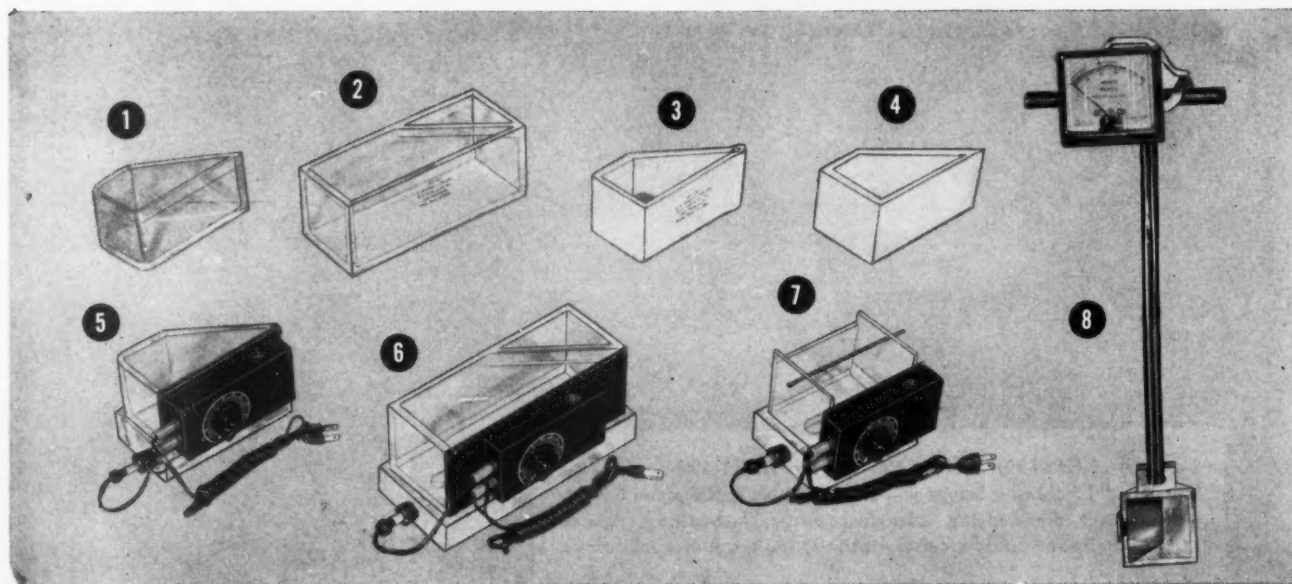
NORTON
ABRASIVES

*Making better products . . .
to make your products better*

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives
Sharpening Stones • Pressure Sensitive Tapes

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

ARE YOU USING THE RIGHT HULL CELL ... FOR THE RIGHT JOB?

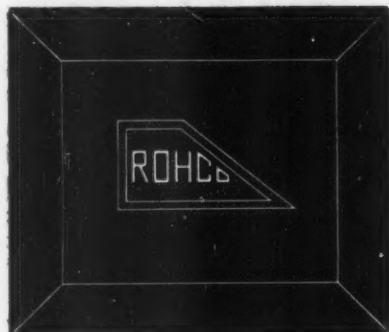


Here's the Line-up of the Championship HULL CELL Team!

1. Lucite 267ml. Hull Cell for all plating baths except chrome.
2. Lucite 1000ml. Hull Cell for all plating baths except chrome, preferred for bright nickel.
3. Solid-wall Porcelain 267ml. Hull Cell for general use, especially chromium. The ONLY cell that can be placed directly on a hot plate.
4. Molded Polythene 267ml. Hull Cell for all baths up to 180°F.
5. Lucite Model "WT" 267ml. Hull Cell with quartz heater and built-in thermostatic control; for all plating baths except chrome.
6. Lucite Model "WT" 1000ml. Hull Cell with quartz heater and built-in thermostatic control. The "WT" Hull Cells are convenient for making uniform, repeat plating tests at bath operating temperatures. The "WT" 1000 ml. Hull Cell is preferred for bright nickel.
7. Lucite "WT" Duplicell with quartz heater and built-in thermostatic control. For making duplicate bright nickel deposits preparatory to testing chromium baths for optimum catalyst ratio. (Plain Duplicell, without heater and thermostat, is also available.)
8. The Hanging Hull Cell is a novel device for making plating tests under production conditions. Indispensable for checking each operation in a plating cycle.

Order yours today, or ask your nearest ROHCO distributor for a demonstration!

R. O. HULL & COMPANY, INC. 1301 Parsons Ct., Rocky River 16, Ohio



DISTRIBUTORS: CHICAGO, Ardco, Inc. • TORONTO, CANADA, Armalite Company, Ltd. • LOS ANGELES-SAN FRANCISCO, Crown Chemical & Engineering Co. • ST. LOUIS, Davies Supply & Manufacturing Co. • BINGHAMTON, Austin F. Fletcher, Inc. • NEW ENGLAND, NEW YORK, PENNSYLVANIA, Enthone, Inc. • MINNEAPOLIS, W. D. Forbes Co. • DETROIT, George L. Nankervis Co. • SEATTLE, Carl F. Miller & Co. • GRAND PRAIRIE, TEXAS, Weaver Engineering & Supply Co.

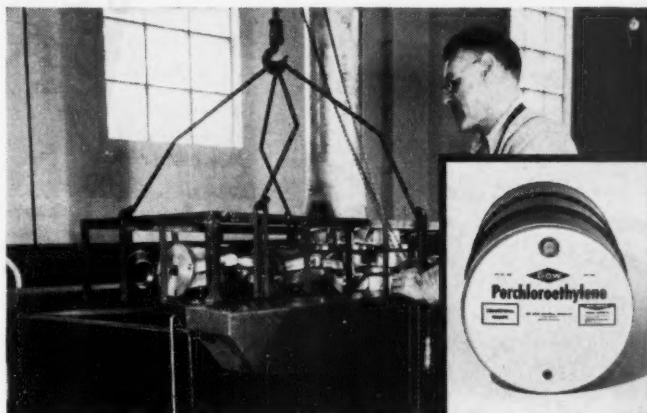
"THE HULL CELL TEST MAKES PLATING BEST!"



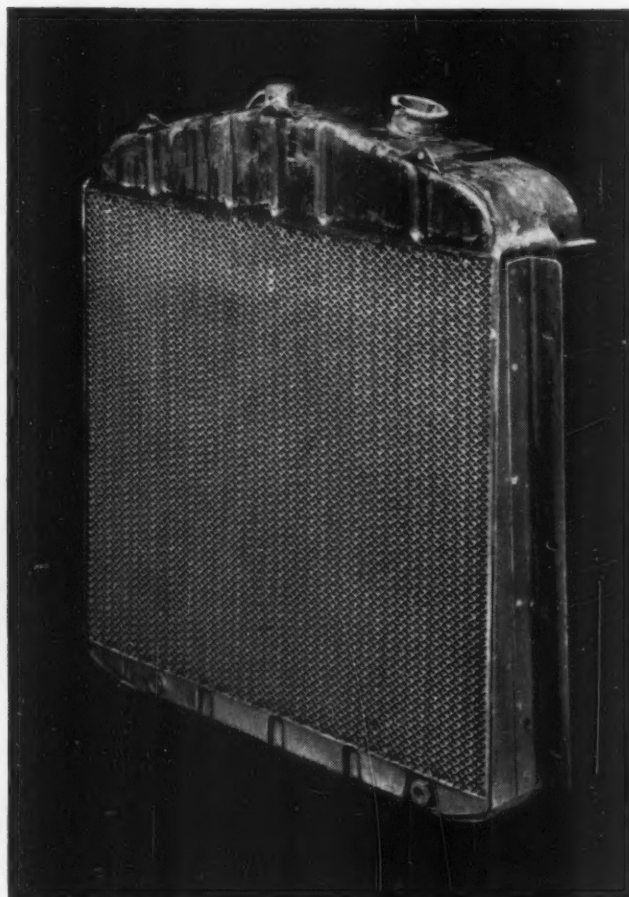
DOW ... industry's most complete line of chlorinated solvents



Heavy buffing compound residue is generally tough to remove . . .



but comes off quickly and economically with vapor degreasing . . .



leaving parts clean, bare, dry, ready for next operation.

when parts are heavily contaminated • when they're thin-gauge metal

DOW PERCHLOROETHYLENE

CHECK THESE VAPOR-DEGREASING ADVANTAGES

- Better solvent action on contaminants
- Safer—nonflammable
- Lower solvent losses
- Better removal of moisture from work
- Better stability with light metals

You can make tough, trouble-making runs *faster* . . . get *fewer rejects* . . . operate at *greater over-all economy*. The answer? DOW PERCHLOROETHYLENE. Why? This stabilized solvent's higher boiling point gives longer, more thorough cleaning action before temperature of the parts reaches that of the solvent. Buffing compounds and heavy greases roll off. Thin-gauge parts don't require second or third reruns.

Contact your Dow distributor today for a supply of superior DOW PERCHLOROETHYLENE. He's the source for your *other* specialized solvent needs, too . . . stabilized DOW TRICHLOROETHYLENE and CHLOROTHENE*, the versatile new *cold* degreaser. For detailed information on any one or all of these chlorinated solvents, simply send a post card to THE DOW CHEMICAL COMPANY, Dept. S671A, Midland, Michigan.

*TRADEMARK

you can depend on DOW SOLVENTS



MICCRO COATINGS

Make Tough Jobs EASY!

MICCROSOL
E-1003



Today's outstanding heat-cured rack coating. Meets industry's highest standards for corrosion and abrasion resistance.

MICCROSTOP



For extreme accuracy in masking parts for all plating cycles.

MICCROMASK



Provides complete masking protection for hard chromium plating.

MICCROPEEL



A special lacquer that can be peeled easily from parts after all plating cycles.

MICCROWAX



Two waxes widely used for selective stop-off. C-562 for hard chromium; C-600 for high temperature cycles.

MICCROTEX



An air-dry rack coating for all plating cycles. Excellent for patching and repairing.

MICCROTAPE



An extruded tape which provides unexcelled protection for plating racks, and for masking parts prior to selective plating.

MICCROTUBE



Extruded tubing especially suited for use on contact wires, and for selective plating of simple parts.

MICCROLOID



Corrosion-resistant industrial maintenance paint.

THEY'RE
TOPS!



Developed and manufactured
by experienced platers

• WRITE FOR PARTICULARS ON COMPANY LETTERHEAD



MICHIGAN CHROME *and Chemical Company*

8615 Grinnell Avenue • Detroit 13, Michigan



Cut upkeep costs with **"FLOTE"**

... recent water-wash spray booth discovery —
Only 75 cents a day saves up to \$3500 a year!

"FLOTE"* eliminates sinking paint sludge — even with heavy primers; stops clogging, backwall build-up!

Regardless of the type of water-wash spray booth you use — and no matter what organic finish you use — Wyandotte "FLOTE" will improve operating efficiency, cut maintenance costs. Just add "FLOTE" to your water system!

For "FLOTE" floats all types of paint overspray—even heavy primers—and keeps them afloat for easy skimming. Eliminates most foaming problems, too!

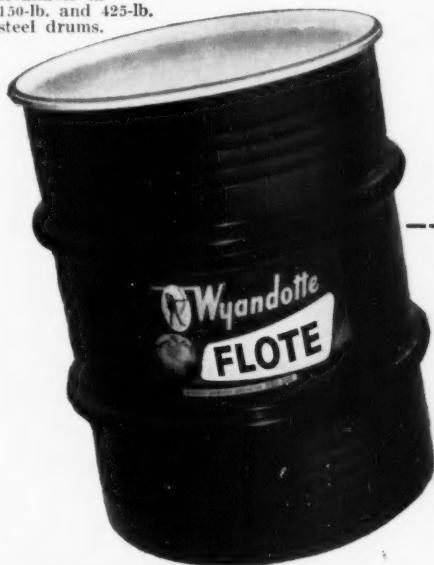
Enthusiastic users of "FLOTE" include: one of the world's largest camera manufacturers; a leading farm-machinery company; a large truck-trailer producer; air-conditioning firms; a leading furnace manufacturer; an aircraft factory — even a mammoth auto maker . . . plus appliance and furniture manufacturers, and many, many more!

If you'd like to float away your spray booth problems, and cut maintenance costs, mail coupon for full data on Wyandotte "FLOTE." Do it today!

Wyandotte Chemicals Corp., Wyandotte, Mich.
Also Los Nietos, Calif. Offices in principal cities.

*PATENT APPLIED FOR

Available in
150-lb. and 425-lb.
steel drums.



In a water-wash spray booth, like the one above, as little as 75 cents worth of "FLOTE" a day can save you up to \$3500 a year! "FLOTE" is a complete product — nothing else to add!



Wyandotte CHEMICALS

J. B. FORD DIVISION

WYANDOTTE CHEMICALS CORPORATION
Wyandotte, Michigan

Send me further data on "FLOTE" ☐

Have a representative call ☐

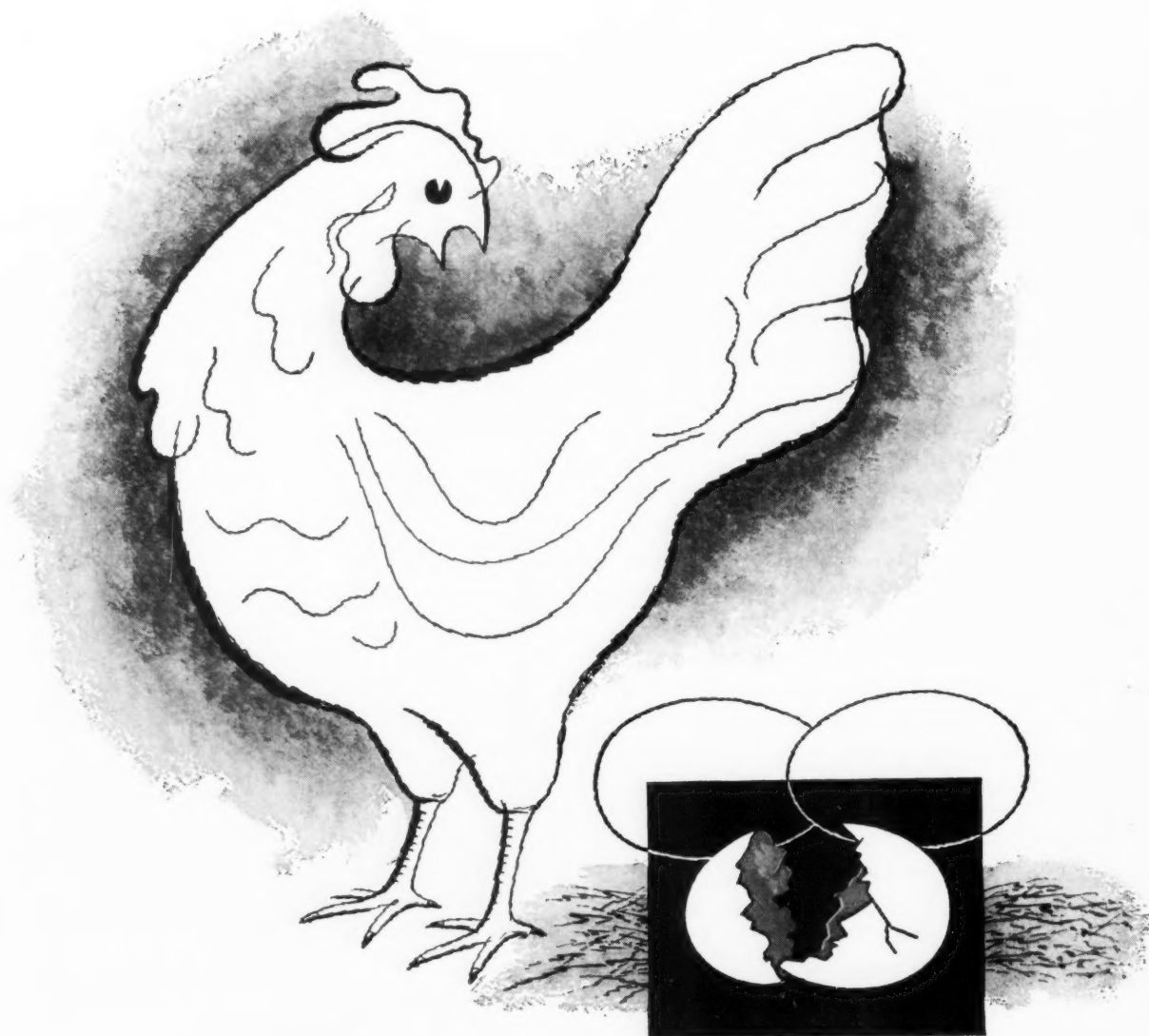
Name

Firm

Address

City Zone State

LARGEST MANUFACTURER OF SPECIALIZED CLEANING PRODUCTS FOR BUSINESS AND INDUSTRY



STOP WASTING... PROFITS

In solving your plating waste treatment problems, Graver equipment can save the dollars you've been throwing away. In addition to avoiding pollution, treated "waste" can often become a source of valuable raw materials and water suitable for process use. Graver equipment, backed by 45 years of experience and research, is specifically engineered to get such results for you.

Write for the following bulletins and articles:

- WC-116.....Industrial Waste Treatment
- WC-111.....Ion Exchangers
- T-123.....Applications of Ion Exchange to Plating Plant Problems
- T-130.....Ion Exchange, A Practical Tool in the Plating Room



Industrial Waste Treatment Department: W-112-A
GRAVER WATER CONDITIONING CO.
A Division of Graver Tank & Mfg. Co., Inc.
216 West 14th Street, New York 11, N. Y.



News about **COATINGS for METALS**

Metallic Organic Decorative Protective

More reports of better chromium plating

A complete "package" of processes for chromium finishing

Unichrome Copper, Unichrome Bright Nickel and SRHS Chromium are so thoroughly suited to each other, they represent something unique in finishing. They're the first matched set developed exclusively by one company. Used together, they add up to more advantages than the sum of their individual benefits.

Better Operations and Results

Unichrome Pyrophosphate Copper contains no cyanide, saves disposal costs, and reduces or eliminates much buffing expense.

Unichrome Bright Nickel cuts downtime for purification, has unusual operating stability.

When both of these processes are used along with SRHS Chromium, benefits begin to multiply. The copper proves active for the nickel. In turn, the nickel shows unusual receptivity for the chromium. Passivity problems are eliminated. Downtime drops, rejects become rare.

Moreover, service responsibility rests with one source, assuring prompt technical help and a smooth running operation.

Bulletins supply details on each of the processes. Send for them.

UNITED CHROMIUM DIVISION

METAL & THERMIT CORPORATION

100 East 42nd Street, New York 17, N. Y.
Waterbury 20, Conn. • Detroit 20, Mich.
East Chicago, Ind. • El Segundo, Calif.

In Canada:

United Chromium Limited, Toronto 1, Ont.

Here are plants' experiences with deposits from Unichrome SRHS Solutions*

Companies using both SRHS Chromium Solutions and ordinary chromium have had an opportunity to compare results. Substantial differences have been reported.

BETTER COLOR NOTED

One plant of a well known company was using ordinary chromium over an ideal nickel surface. Another of this company's plants wasn't getting the best nickel deposit possible, but still its chromium plating had brightness superior to that of its sister plant. The second plant ascribed the difference to the SRHS Chromium being used in its tanks.

MINIMIZED REJECTS REPORTED

At one company, intricate parts were causing chromium plating difficulties. On occasion, rejects ran as high as 25%. Yet when the SRHS Chromium Solution was

used, deposits covered beautifully and work was plated at a reject rate of no more than 0.4%.

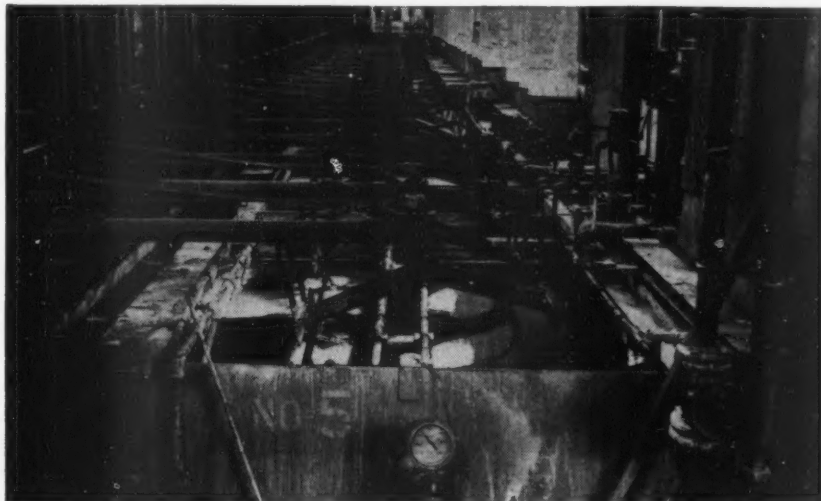
UNUSUAL WEAR RESISTANCE FOUND

A large tool company chromium plated punches used in the manufacture of nuts. Various chromium solutions were tried. They reported that while ordinary chromium doubled the output from punches, deposits from SRHS Chromium tripled it.

All these reported "deposit-advantages" are in addition to the many thoroughly confirmed operating advantages of SRHS Chromium baths. These include plating with higher cathode efficiency, greater speed, a saving in power, and self regulation of important bath constituents.

Platers not using Unichrome SRHS Chromium will find it to their advantage to get the facts by writing United Chromium.

**Trade Mark*



Performance of SRHS Chromium Solutions has resulted in their extensive use by major plating plants.

CONTROLLED GRAIN SIZE: APW Extrusion Process* controls grain size within definite limits—*minimizes shedding!*

**ROLLED
FLAT PLATE
ANODE SECTION:**

This Photomicrograph shows highly irregular, uncontrolled grain size — a major cause of shedding and resultant rough electrodeposits.



**APW EXTRUDED
ANODE SECTION:**

Note small, fully controlled regularity of grain size that promotes uniform corrosion, smoothest electrodeposits, less rejects.



*Pat. Pending

NEW!

SHAPED, EXTRUDED APW SILVER ANODES

STANDARD
SHAPES:

"RECTANGULAR"

"TEAR DROP"

"DOG BONE"

The common problem of shedding and all of its costly results in electroplating can now be virtually eliminated with the radically new extruded, shaped silver anodes made by an exclusive APW-developed process.

The small and uniform grain size produced in the new APW extruded anodes is controlled between definite ideal limits as illustrated above. As a result, corrosion is *smooth and uniform*—with consistently smooth electrodeposits. Rejects are a comparative rarity.

The new APW extruded anode provides equally important advantages by redistribution of mass metal in scientifically determined shapes. While conventional rolled flat plate anodes quickly

wear to a sharp knife edge from which silver particles break loose readily, APW shaped anodes maintain substantially rounded edges for practically the complete life of the anode. Anode area is also appreciably prolonged. After 85% by weight has been plated off, *this APW anode retains 80% of original active surface area!* You profit with the longer, useful life of the anode . . . polarization is minimized . . . there is less silver scrap to be refined.

APW will develop special anode shapes to meet particular plating bath conditions. You are thus assured of utilizing the silver you buy in anodes most efficiently. Feel free to consult us on any anode problems you may have. ★ ★ ★

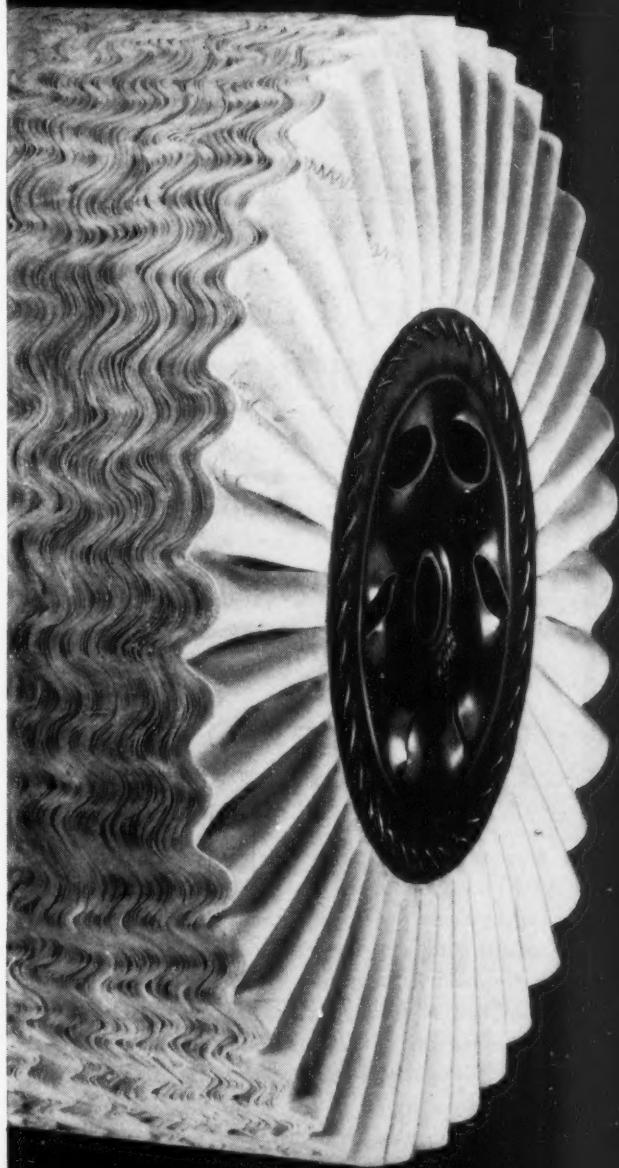
THE AMERICAN PLATINUM WORKS



231 NEW JERSEY RAILROAD AVENUE • NEWARK 5, NEW JERSEY

COLOSSUS

Air-Cooled Bias Buffs



JAMES H. RHODES & CO.

157 W. Hubbard St., Chicago 10, Ill.

48-02 Twenty-Ninth St., Long Island City 1, N.Y.

Revolutionary New Principle!

23% GREATER SERVICE DUE TO 45° FABRIC BIASING

Because Colossus Bias Buffs made on Rhodes special biasing equipment have 23% more strong warp fibers on the working surface. Ordinary biasing equipment can only cut at 35°.

ONE WAY WARP DIRECTION ON ALL PLIES

All warp fibers are headed into the work like teeth of a saw and are the fibers that do the work. Not center folded as ordinary buffs with half the fibers in the opposite direction, loafing along, wasting compound and causing ridges in work. No rejects with Colossus Air-Cooled Bias Buffs.

FORCED AIR VENTILATION

Center plate has air scoops to bring air into center of polishing head. Air is expelled through vents between sections to cool working surface.

PRECISION CONVOLUTION PLEATS

All pleats precision formed on Rhodes revolutionary machinery. Plies and sections nest into each other to create a uniformly denser working surface. Always in perfect balance.

WIRE STITCHING

Tough 18 gauge piano wire stitched through two pleats and both center and ring. Has greater resistance to explosion—the safest buff on the market.

UNIFORM POLISHING SURFACE CUTS REJECTS

Colossus Air-Cooled Bias Buffs precise interlocked convolution pleats produce an even wiping surface over object being polished. No gaping holes or wrong way fibers to produce gouges or high spots in work. No rejects with Colossus Air-Cooled Bias Buffs.

FLAT FABRIC SEAMS

Made with a zigzag stitch for strength without bulk. No heavy stitching to scratch work.

GREATER DENSITY FOR FASTER CUTTING

Colossus Bias Buffs due to their uniform convolution pleats present a firmer working surface than an ordinary buff of equal density. Some sizes can also be made in densities of C8 and C10.

ADAPTABLE AS CONTACT WHEELS

Because of their uniform even surface, they make excellent contact wheels without special stitching and at a great saving over rubber wheels.

Send in coupon below if you are interested in a personal, no-obligation call from one of our representatives to give you greater details on how Colossus Air-Cooled Bias Buffs can help you save time, money and material.

James H. Rhodes & Company

157 W. Hubbard St., Chicago 10, Ill.

48-02 Twenty-Ninth St., Long Island City 1, N.Y.

NAME _____ TITLE _____

COMPANY NAME _____

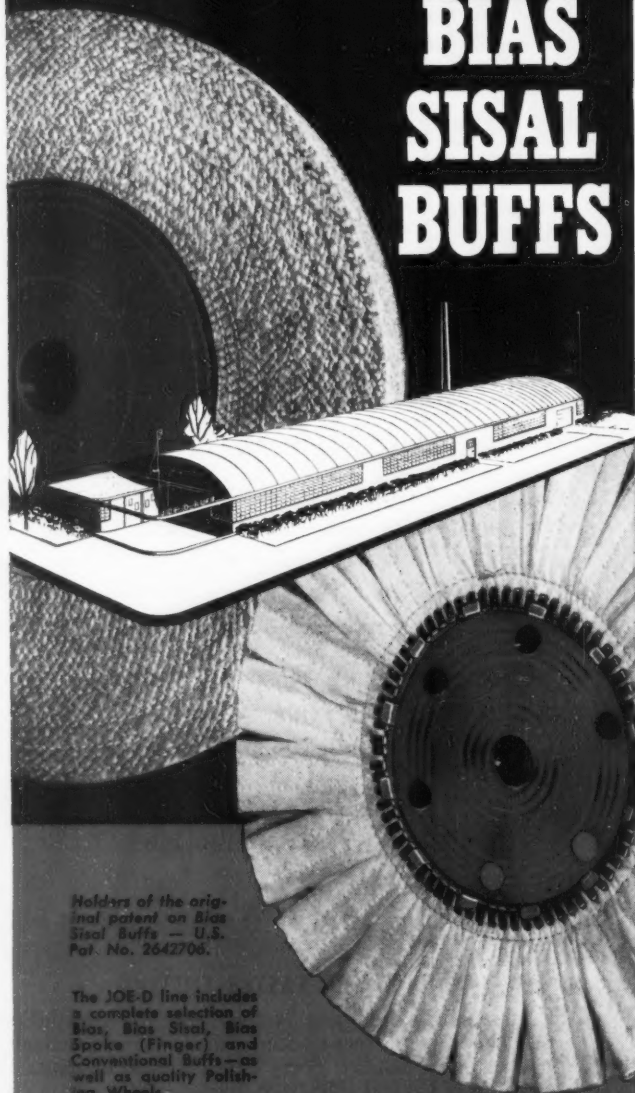
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CITY _____ STATE _____

The "House that Sisal Built"

JOE-D ... Originators of

**BIAS
SISAL
BUFFS**



Holders of the original patent on Bias Sisal Buffs — U.S. Pat. No. 2642706.

The JOE-D line includes a complete selection of Bias, Bias Sisal, Bias Spoke (Finger) and Conventional Buffs—as well as quality Polishing Wheels.

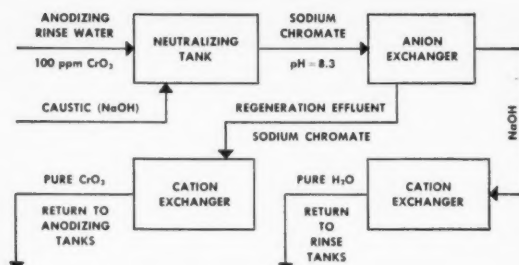
Since its founding, the JOE-D Buff Company has specialized in Sisal—constantly experimenting and testing ways to give you faster-cutting, longer-lasting Sisal Buffs. Made of the finest quality imported sisal, specially woven and processed for guaranteed fray-proof performance . . . never a loose end to whip or scratch . . . always an even nap to hold compound and provide better color. For every Sisal Buff requirement, specify JOE-D, the original—and still America's finest—Bias Sisal Buff!

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The block diagram above indicates one method of using ionXchange to save money, in the plating rooms of a large automobile plant, by recovering the chromic acid from the rinse tanks of anodizing operations. The cost of equipment was much less than the cost of a disposal plant, and the savings through recovery were substantial enough to make the investment a very profitable one.

REMOVAL OF ALUMINUM FROM ANODIZING BATH

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Applications: Vessels, valves, pipe and fittings, extrusion screws, dryer rolls, pumps, dry cleaning equipment, tanks and others.

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Applications: Piston rods, crank shafts, pump casings and impellers, aluminum parts and others.

SALVAGE — Remarkable uniformity of coating permits build-up of mis-machined parts without regrinding or remachining.

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Applications: Solder adhesion, undercoat for bright or hard Chromium, dip tinning, plating of sintered metal parts and others.

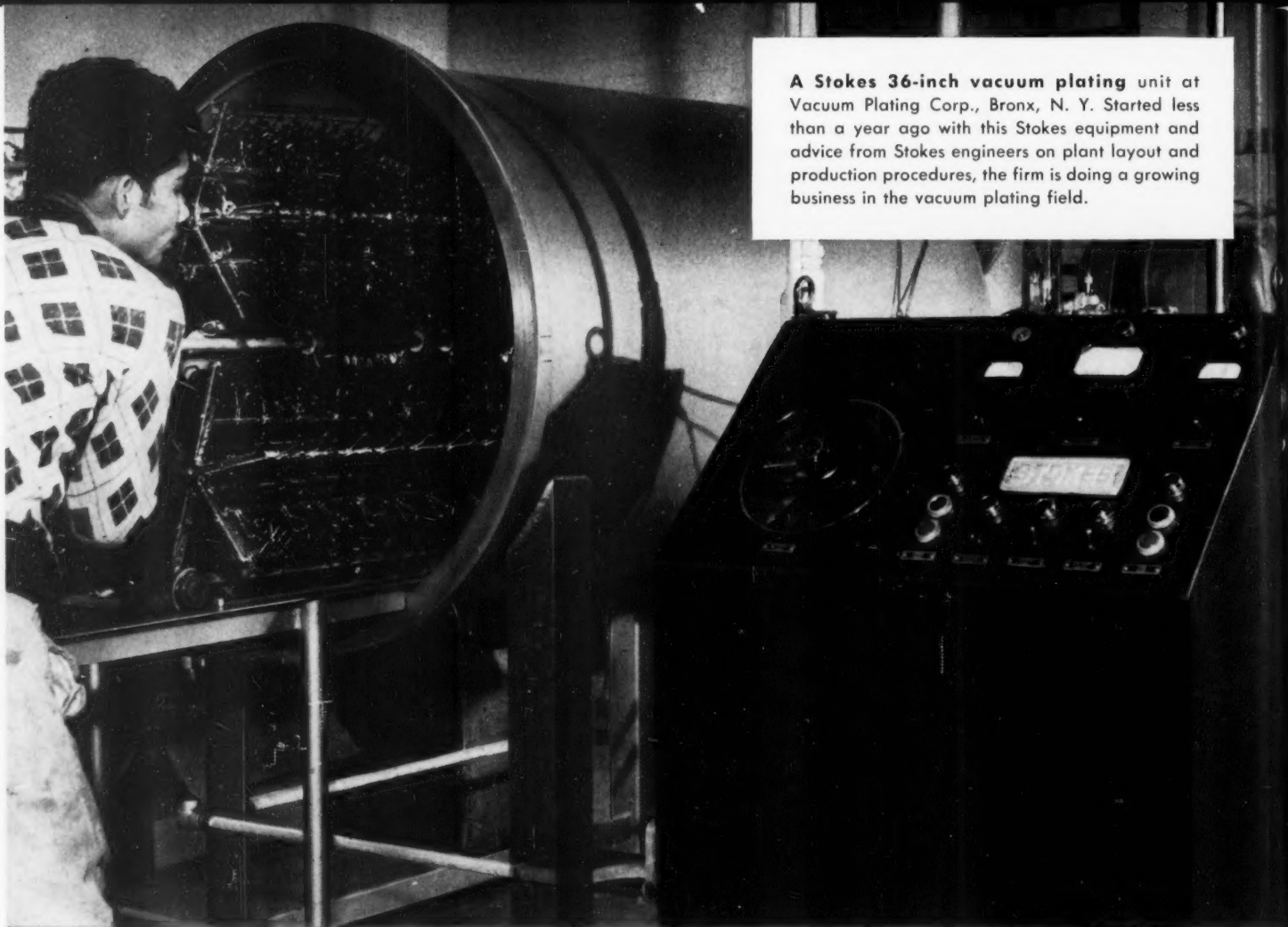
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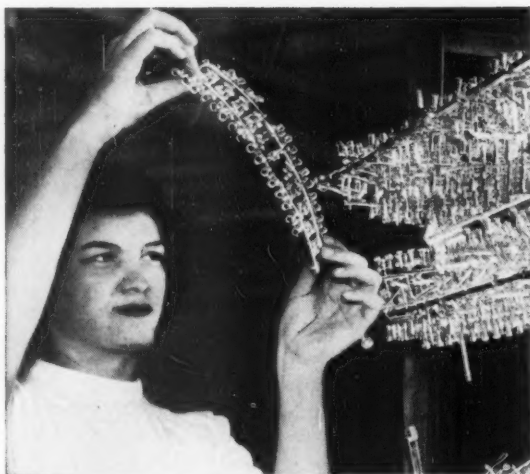


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Stokes builds vacuum plating equipment in 24, 48 and 72-inch sizes as well. Our vast experience in the application of this popular finishing method is at your service, to plate your sample parts and advise on efficient plant layout. Send for an informative brochure on the Vacuum Metallizing Process, Catalog 780.

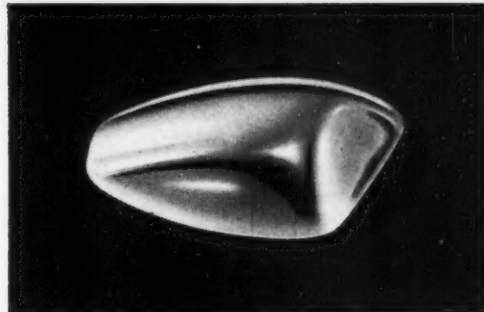
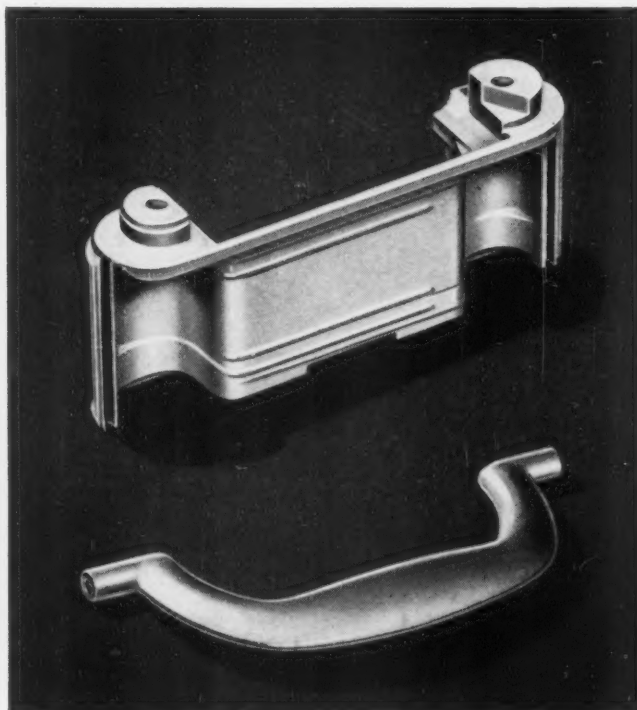
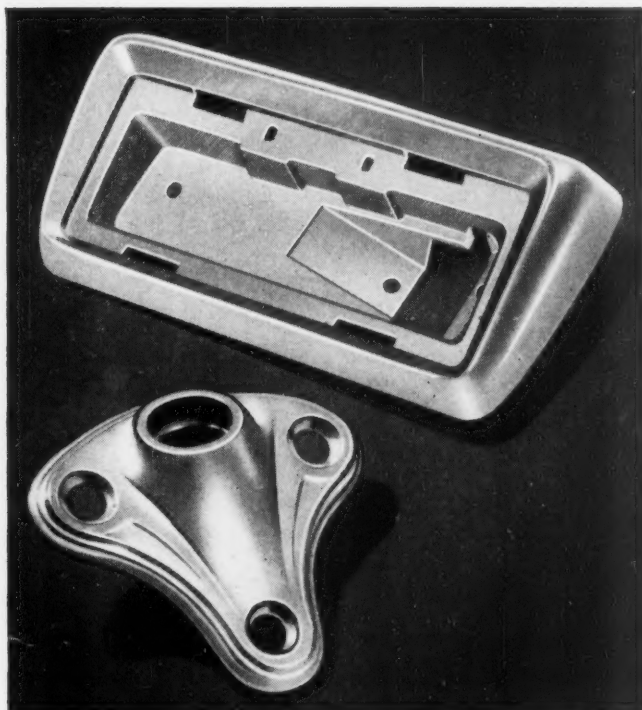
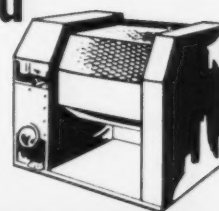
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STOKES



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HERE'S HOW! On zinc or aluminum die castings, HONITE "Micro Cut" Compound gently and quickly polishes out surface imperfections without "skinning" or exposing porosity—and reduces impingement or nicking, because it holds the parts firmly in the chip mass during the run. You get a quality surface for quality plating on zinc die castings . . . a super smooth surface on aluminum die castings . . . with no need for extra rinsing or coloring!

Write today for a demonstration in your plant of HONITE "Micro Cut" Compound.



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DEPT. DS-105, ST. PAUL 6, MINN.

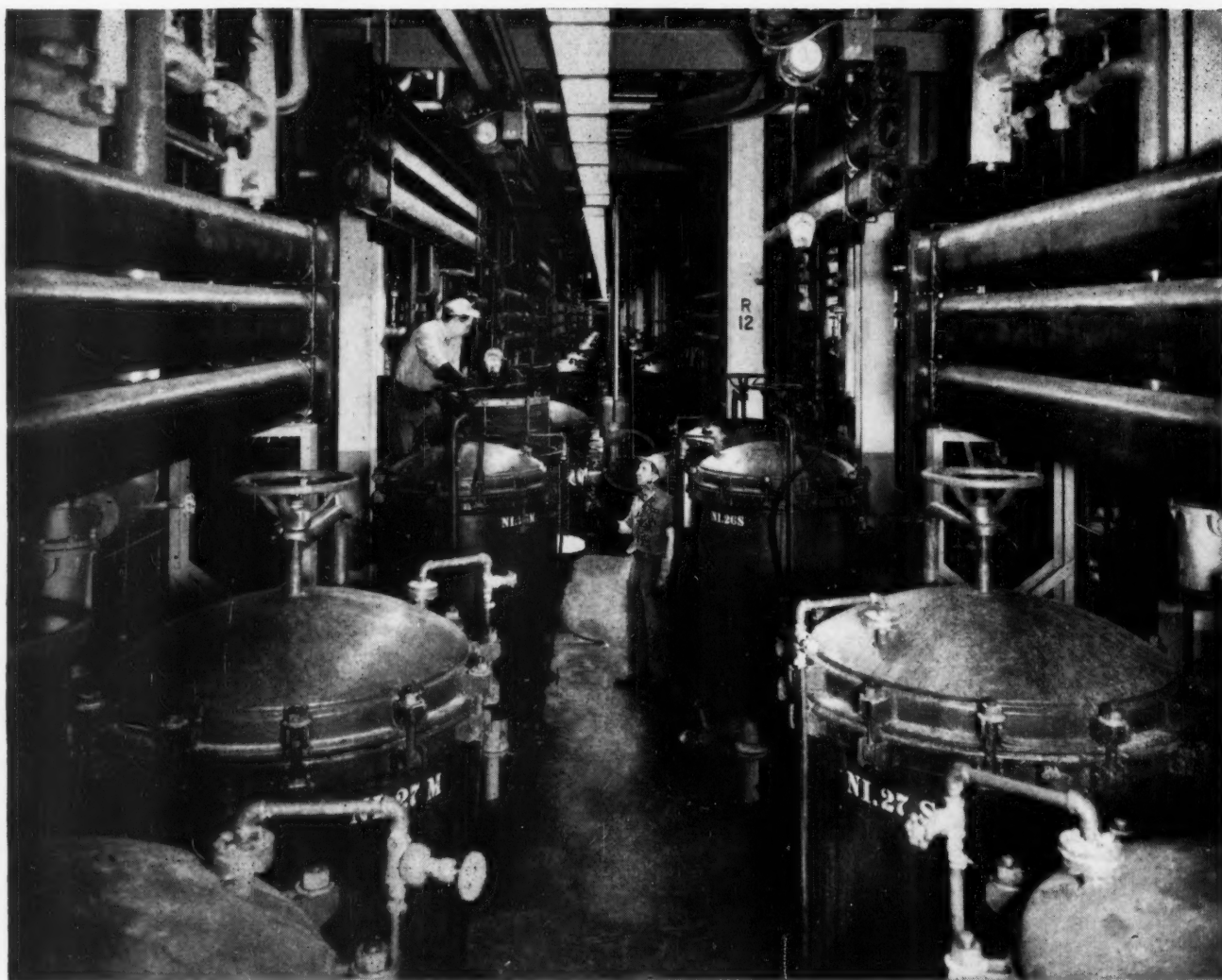
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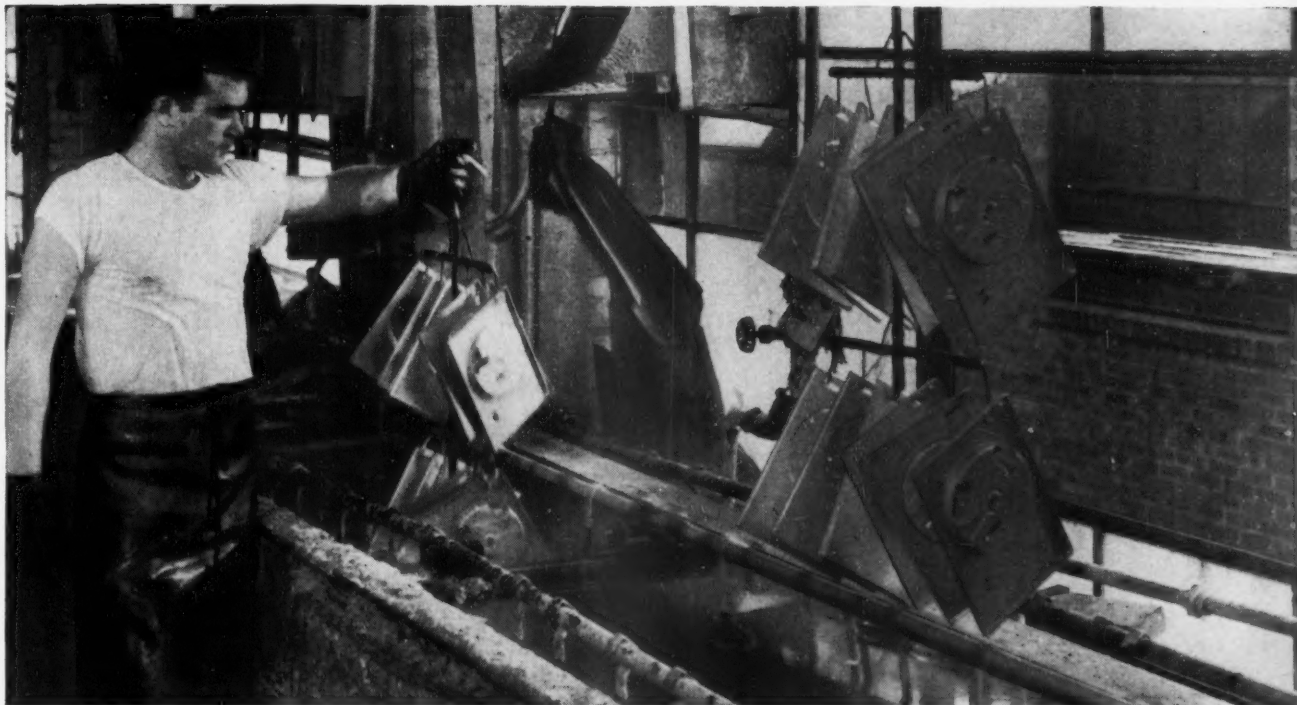
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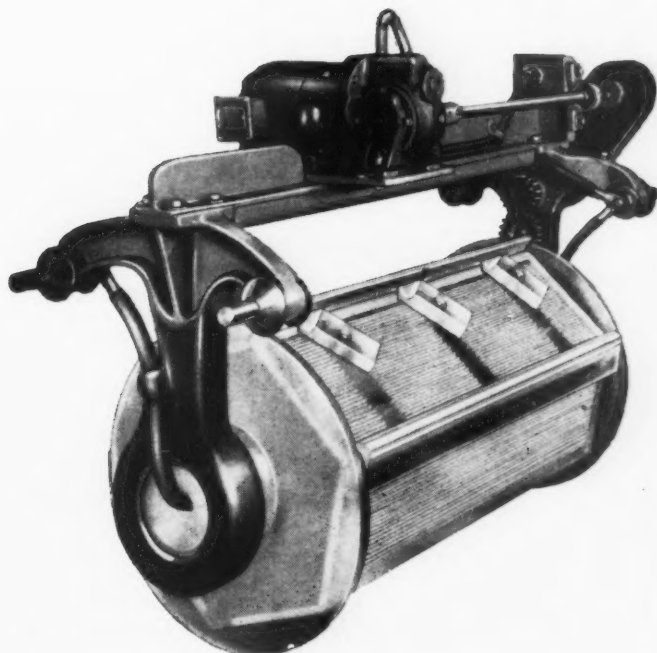
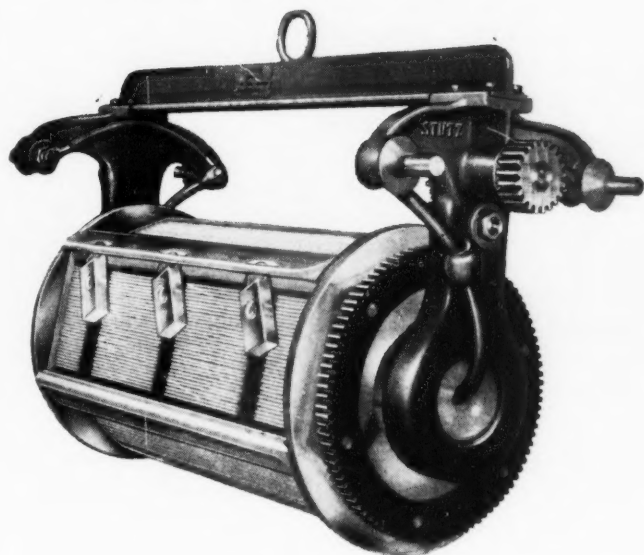
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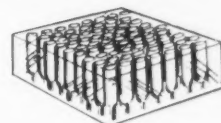
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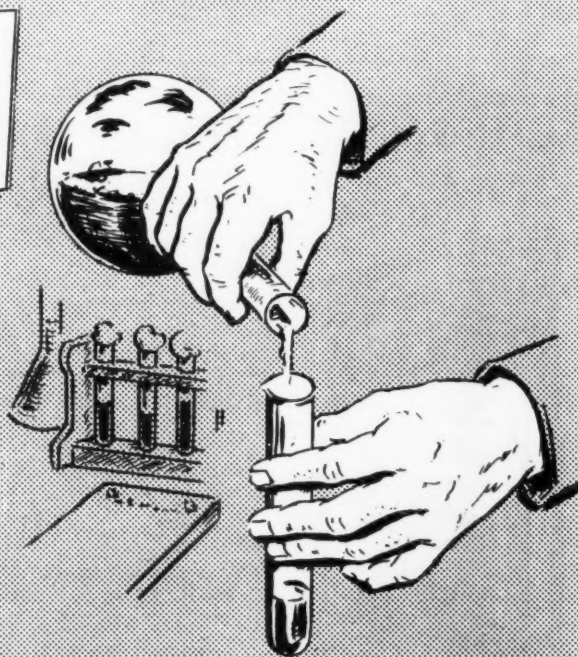
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Wt. . . 60 lbs.
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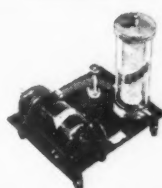
SERVICE . . . Filters practically any acid or alkaline solution from PH 0 to PH 14; removes particles down to one micron in size.

DESIGN . . . Filter Assemblies fabricated of stainless steel 316, H. T. Lucite, Rubber-lined steel, Haveg, Epoxy Resin, Rigid Vinyl, Polyethylene, Teflon, etc. . . **Filter Tubes** of cotton, dynel, porous stone or porous carbon . . .

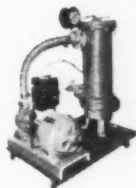
Pumps fabricated of Hastelloy, stainless 316 or plastic; centrifugal or self priming . . . **Motors**, totally enclosed, ball bearing, choice of current characteristics . . . **Hose** — special acid and alkali resistant . . .

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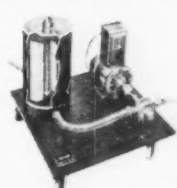
Models Centrifugal Pumps	Models Self Priming Pumps	Rate Capacity Gal./Hr.
LSI-5	LSIN-5	50 g/h
LSI-10	LSIN-10	100 "
ASI-300	ASIN-300	300-450 "
ASI-400	ASIN-400	400-600 "
ASI-600	ASIN-600	600-900 "
RLS-1200	RLSN-1200	1800 "
RLS-2400	RLSN-2400	2400 "



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Centrifugal Pump. H. T.
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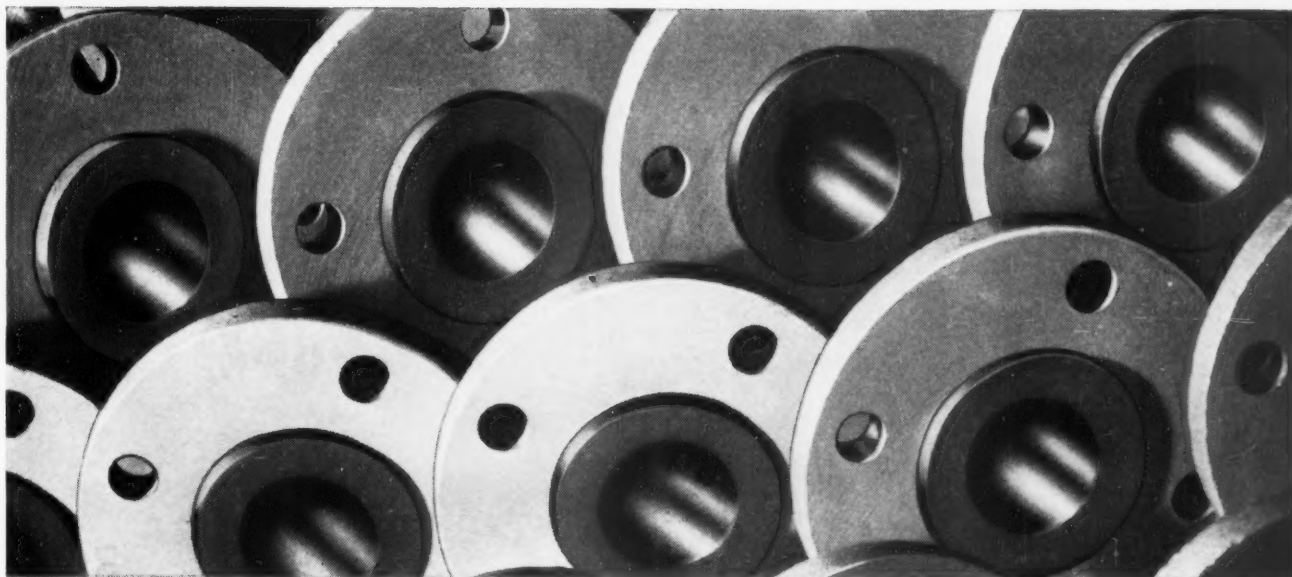
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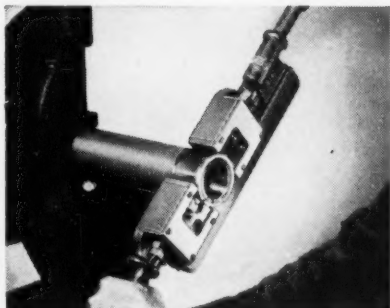
Now you can convey chemicals and many other corrosive liquids without worrying about costly shutdowns due to corrosion. For saran lined pipe, fittings and valves are corrosion-resistant . . . form snug, leakproof joints . . . which won't burst up to 150 pounds working pressure.

They're easily and inexpensively installed because they can be cut and threaded in the field with any standard pipe fitter's tools. Their rigidity means that few supporting members are needed.

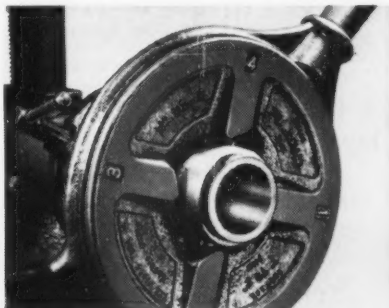
Saran lined pipe, fittings and valves have a proved record in industry of bringing long trouble-free service. If your operation requires superior resistance to most chemicals and solvents, be sure to investigate saran lined pipe. Contact the Saran Lined Pipe Company, 2415 Burdette Avenue, Ferndale 20, Michigan, Department SP527-C-2.

RELATED SARAN PRODUCTS—Saran rubber tank lining • Saran rubber molding stock • Saran tubing and fittings • Saran pipe and fittings.

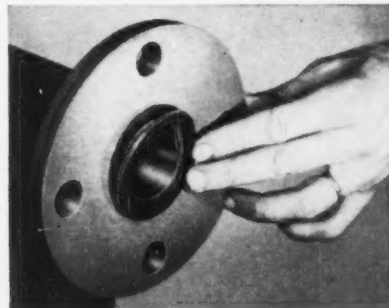
Saran Lined Pipe Can Be Fabricated Right in the Field!



An adapted Beaver Cutter cuts away the end of the steel pipe so that $\frac{3}{16}$ " of the saran lining is extended. This assures a tight seal after a flange is applied and connected with another flange.



A ratchet type thread cutter makes the standard threads after the Beaver Cutter has been used. A flange or union fitting is attached and tightened until the liner is flush with the fitting.

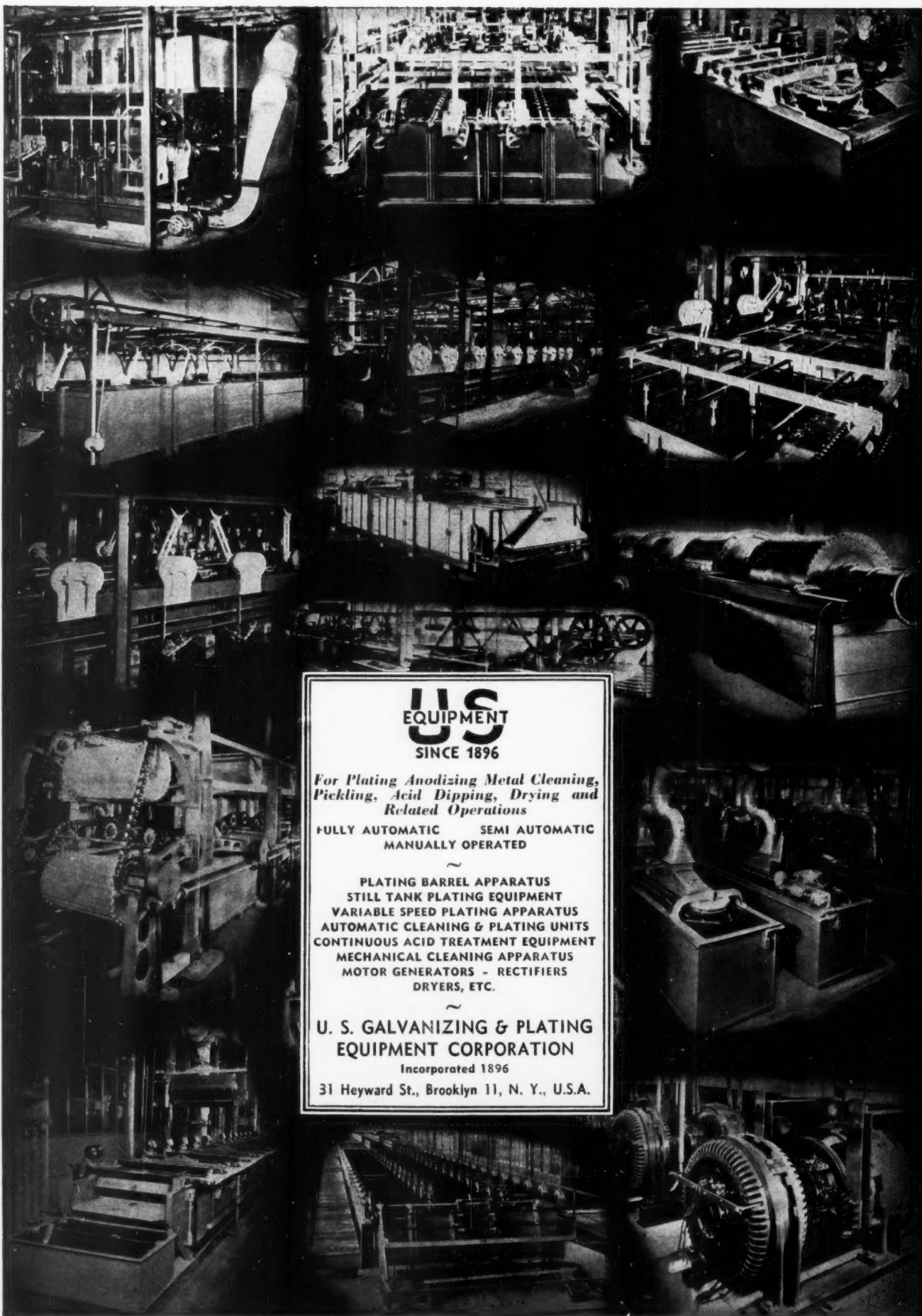


If two flanges, or a union fitting, are used to make a pipe connection then a full gasket is required. If a flange is made up against a flange fitting or spacer then a half gasket is required.

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OCTOBER, 1955

Volume 53 Number 10

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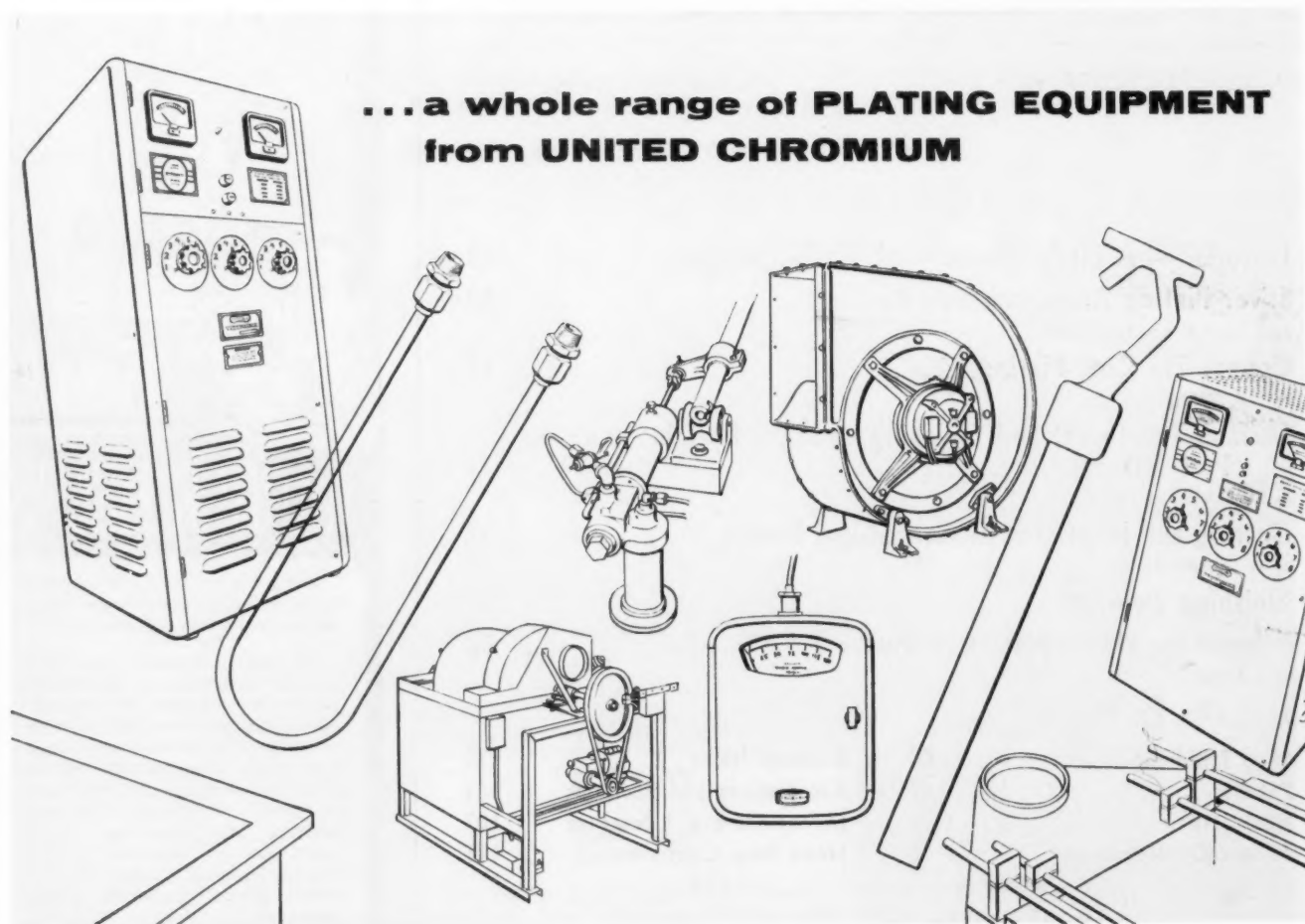
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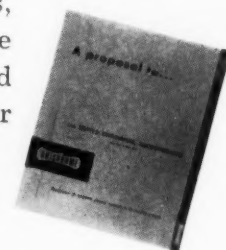
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A Little Worse - - A Little Cheaper

"There is hardly anything in the world that someone cannot make a little worse and sell a little cheaper — and the people who consider price alone are this man's lawful prey." — Ruskin.

A century ago, Alexander Watt was warning, in his classic book, "Electrodeposition," that the introduction of electroplating was favoring unscrupulous persons who would offer plated articles as made of solid gold. We still have laws against such misrepresentation as the "gold brick," but there is no law to protect a manufacturer from the consequences when he shops around for what is known as a "commercial" finish at the lowest price. Yet, there will always be purchasers who think they can get something for nothing.

The large manufacturer, who jobs out all his finishing requirements or his overflow production, specifies, in complete detail, what he expects from his plater in the way of quality. He also has the staff and facilities to check for proper performance, and the resources to insure compliance with the terms of the contract. If this manufacturer is quoted a ridiculously low price, it's the plater who takes the loss resulting from his inability to figure his costs correctly.

It is the small industrialist who usually makes the mistake of seeking the lowest price without obtaining any guarantee of quality. Without testing facilities; often even without experience as to the quality of finish his product requires, he is at the mercy of his finisher. He is the fellow who can be told that the poor surface of the metal accounts for the mediocre finish, whereas the truth of the matter is that the finisher cut corners by eliminating a grease-wheel operation before buffing. The price-cutting plater doesn't have to inform the customer that a copper flash was used, instead of a heavy deposit, on a lot of zinc base die castings, so that diffusion over a period of time will result in eventual blistering. He needn't say anything about eliminating a passivating dip, which would inhibit staining on his zinc plating. These are the things which permit him to quote a lower price, yet make a larger profit.

John Ruskin's words of wisdom apply just as much today as they did when they were penned many years ago. And they will still apply when we are gone, because human nature will not change. The subject is pertinent since, unfortunately, a poor quality finish reflects on the reputation of the industry as a whole, not only on the finisher who can see no further than the end of his nose.

Nathaniel Hall

Silver Plating Aluminum Bus Bars

By Julius Toth and H. E. Ricks, Standard Control Division, Westinghouse Electric Corp., Pittsburgh, Pa.

DURING the Korean incident, attention was called to the use of aluminum as a substitute for copper on bus bar applications. At first, company men were rather skeptical, but on further examination, began to like what they saw. Here was a metal one-third the weight of copper, having physical properties approaching copper, and electrical conductivity approximately 61% of copper. In event of continued copper shortage, aluminum could be obtained in plentiful supply.

The company's experience with aluminum as electrical conductors, up to this time, was rather sketchy and published data was not complete and sometimes contradictory. As the use of aluminum continued to grow in importance, its potential electrical value was realized and steps were taken to solve some of the problems delaying its use.

Aluminum is a very active metal, but has one undesirable characteristic of forming thin invisible oxide films in the presence of air, which are highly resistant. In order to use aluminum for electrical bus bar application, it is necessary that this oxide film be removed and replaced with an electrical conducting material of low resistance. Recommended conducting materials acceptable on aluminum, such as cadmium, tin and silver were analyzed. From these materials, silver was

elected because of its desirable features: for example, lower electrical resistance, and the fact that silver oxide decomposes at elevated temperature, reverting to metallic silver. Furthermore, should silver oxide be present, it presents no problem since silver oxide is electrically conductive.

The problem then was: How to satisfactorily apply silver plating on aluminum bus bars. In order to com-

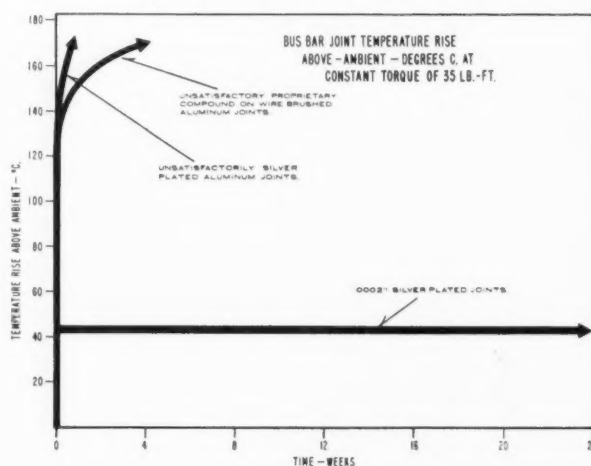


Figure 2

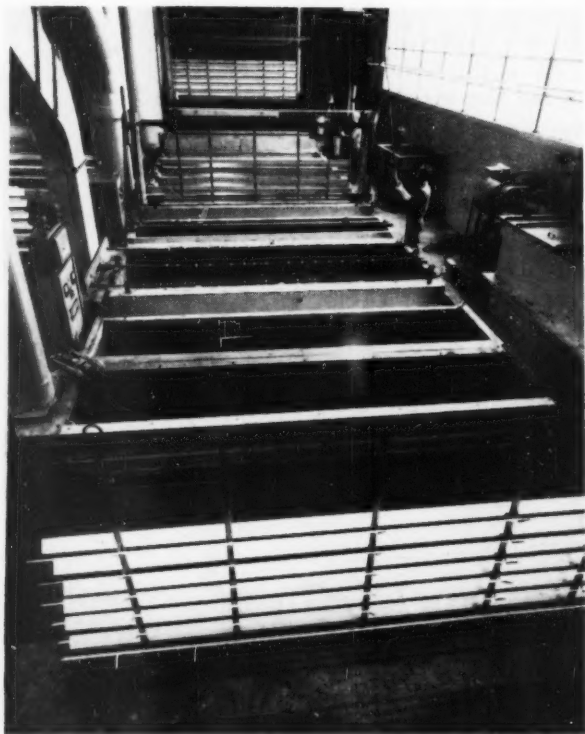


Figure 1

mercially silver plate aluminum bus bar, a new facility was installed at Beaver at a cost well over \$150,000. This facility is shown in Figure 1. The installation is distinctive and exacting. The aluminum bars are positioned properly on the plating racks and then processed through the caustic cleaner, nitric acid dip, sodium zincate treatment, silver strike and silver plate, then dried. Cleanliness of the aluminum bars between each operation is obtained with high pressure clean water rinse operations.

An oxide film on aluminum is not a deterrent to successful plating for decorative purposes, but it is, however, for electrical conductor applications. Experience has proven that, in order to get good conductivity and adhesion of silver to aluminum, it is necessary to completely remove the oxide and efficiently replace it with a protective electrical conducting material. This is accomplished by a step process.

Coating Procedure

The flow line operational or step process consists of 12 operations. The aluminum bars are first interlaced on stainless steel hooks on the plating rack. This rack is then processed through the first operation by complete immersion for 90 seconds into hot caustic solution maintained at 170°F. to remove dirt, oils, or any

other contamination. Of prime importance is the dissolving of the aluminum oxide to expose bare aluminum metal. From the caustic cleaning, the aluminum bars are water rinsed to remove the caustic carryover and to prevent possible neutralizing of the subsequent nitric acid dip, from which the aluminum emerges clean white and with a slight etch. The metal is then given a thorough rinse with water spray to remove the acid. From the water rinse, the bars are completely immersed in a solution of sodium zincate. The reaction of this solution causes a thin film of zinc to be deposited on the aluminum in a short time of approximately 30 seconds. Because of the caustic in the sodium zincate solution, any remaining aluminum oxide on the aluminum is completely dissolved. As the aluminum oxide dissolves, zinc is deposited by chemical displacement on the freshly exposed bare aluminum. The zinc is a tightly adherent coating and serves as a base for the silver strike. Immediately after sodium zincate treatment, the aluminum bars are sub-

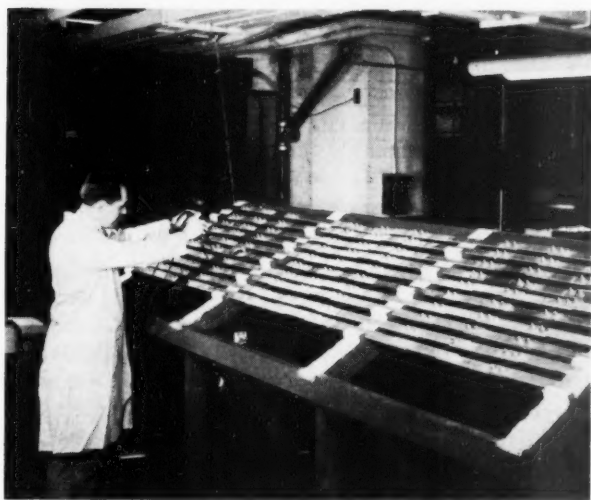


Figure 3

jected to two water spray rinses to remove the sodium zincate solution. During the entire study of establishing a silver plating process for aluminum bus bars, the sodium zincate solution and the following rinse operations were found to be the most sensitive. If the rinsing operations were not complete, the alkaline solution carryover on the aluminum bars, from the sodium zincate solution, would dissolve the zinc coating down to the bare aluminum. This in turn would prevent effective silver plating. The next operation consists of a rapid silver strike at a current density of 20 amperes per square foot for 15 seconds. A question has often been asked, "Why don't we silver plate to specified thickness direct without a silver strike." Experience has shown, that if this is done, a blistering condition would result due to poor silver adhesion to the zinc. This, in turn, would give higher electrical resistance between the silver and zinc coating.

Immediately following the silver strike operation, the bars are transferred to the silver plating tank, where silver plate is applied at a current density of 10 amperes per square foot for 12 minutes. In order to insure uniform accelerated silver deposition, air agitation is used to cause turbulence in the silver plating solution. This action permits higher current densities for faster

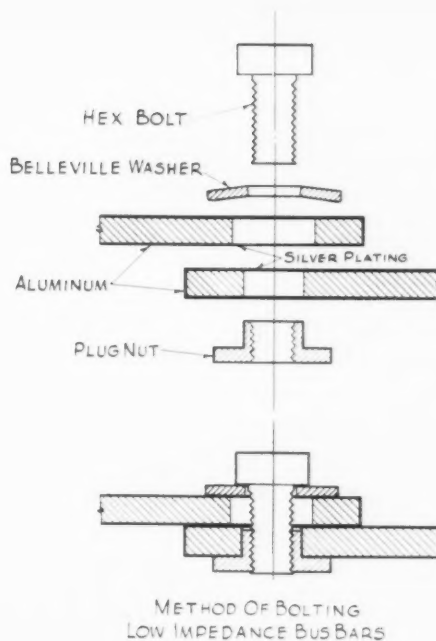


Figure 4

electrodeposition of silver, by keeping the silver ions uniformly distributed in the potassium silver cyanide solution. After silver plating, the bars are cold water rinsed, and then transferred to a hot water rinse to facilitate drying.

The silver plating process, described above, was established to produce the specified minimum silver thickness of 0.0002". To measure this minimum thickness requirement, an electronic silver plate thickness tester is employed which has been found to be accurate to 5 decimal places. Because silver adhesion is so necessary for good electrical conductivity, this is also checked periodically. The check consists of taking a section of silver plated bar and heating it to approximately 275° C. At this temperature, the silver plate should not blister. If blistering should occur, it would be considered poor adhesion. Maintaining silver adhesion and silver thickness requirements is a constant *must* in the plant's operations.

Laboratory testing on silver plated aluminum bus bars is always in process. Figure 3 shows the laboratory set-up for testing various surface preparations between aluminum and aluminum, and between aluminum and copper bus bar joints. These tests have been in progress since August, 1952. Surface preparations tested include silver plating and some of the proprietary compounds. The joints are bolted together in various combinations, in series, and are checked for temperature rise once each week.

Concerning temperature rise, the aluminum bars are cycled 6 hours with current on and 2 hours with current off. The temperature test was established by increasing the current to obtain a temperature rise of 50° C. above ambient on a standard silver plated copper joint in the middle of the assembly. Once the current value was obtained, it was held constant and any fluctuation in the temperature from there on indicated the heating characteristics of each joint. In order to illustrate how complete the tests are, the bolted joint connections include several proprietary compounds on

bare aluminum joints, silver deposits of various thickness and means of application on aluminum joints. Results of these tests to date are not complete, but they do indicate silver plated aluminum joints, regardless of silver plate thickness, are as good as silver plated copper joints on temperature rise and joint resistance. In addition, it has been found that heavy silver thicknesses are not the basic requirement for low joint resistance. Aluminum bus bars, having a flash coating of tightly adherent silver, gave as low a joint resistance on extended laboratory tests as aluminum bars with 0.001 inch silver thickness. In measuring these joints, surface electrical resistance of the mating joint and metal surfaces is determined, and not the internal resistance of the silver, aluminum, or copper. To answer probable questions as to why 0.0002 min. thickness of silver is required, if thinner coating will give the same temperature results, the answer is: silver thicknesses 0.0002" minimum can satisfactorily resist wear for well over 200 operations on plug-in connections, whereas the flash coating will not.

Based on laboratory testing, the curves on Figure 2 were plotted to show uniformity of temperature rise for time beyond 24 weeks, when good silver adhesion is obtained on aluminum. If the silver adhesion to the aluminum is poor, or if unsatisfactory proprietary compounds are used, excessive heating will result in a short period of time, causing a hazardous overheated joint.

Bolting techniques are extremely important for good electrical connections. In any bolted connection, particularly for electrical conductor use, there is a certain amount of relaxation of the bolts due to heat expansion of the joint during operation. When heat expansion occurs, the metal expansion between the joints is restricted mostly to a longitudinal direction, because of bolting restrictions. Once the metal flows, there is no possibility of it returning to its original dimensions when the metal cools. When this happens and the metal does not revert to its original dimensions, we have what is called creep or cold flow. In order to compensate for creep, in bolted assemblies a Belleville washer, sometimes called a "Coned Disc Spring" is employed. Referring to Figure 4, these Belleville washers are used properly and effectively by compressing them to a flattened position by tightening to a known torque value. In this manner, the joints are under a constant uniform pressure, even though the temperature may vary a few hundred degrees. At these elevated temperatures, if the bolt or bus bar suffers creep, the Belleville washer will compensate for the resultant change in dimensions. The bolt illustrated is made from high strength steel having a tensile strength of 95,000 psi and yield strength of 90,000 psi. It has been found that the greater the bearing surface of the Belleville washer, the more ef-

fective is the contact joint because of the increased contact area. Recent technological and engineering advances on latest aluminum alloys may eliminate the necessity of the Belleville washer entirely.

Because of the assumption that the more one tightens a joint, the lower the resistance, the effect of bolt torque on electrical resistance of bolted silver plated aluminum bus bar joints was also investigated. Bolts used for test were $\frac{3}{8}$ -24 hex head high strength steel, which is standard hardware for bolting aluminum bus bar connections at Beaver. The test results showed that the resistance of these bus bar joints decreased as the bolt torque increased up to a torque of 25 to 35 lb. ft., and that the joint resistance leveled off sharply at these torque values with no further decrease in joint resistance for increasing torque. This test proved that a bolt torque of 25 to 35 lb. ft. was sufficient to obtain minimum joint resistance. Additional joint tightening beyond these values will do no harm, but will accomplish nothing.

Readers may be interested in the results of some silver plated aluminum bars already in service. At the start of the company's engineering determination to evaluate the effectiveness of silver on aluminum and the use of aluminum for bus bar applications, the Switchgear Division in East Pittsburgh shipped to the Electronic Tube Division, in Bath, New York, five identical sets of low voltage metal enclosed switchgear containing silver plated aluminum bus and connection bars. These bars were silver plated using the same techniques applied at Beaver. Last October, representatives of the East Pittsburgh Works, visited the Electronic Tube Division, to check the bolted joints for maintained adequate tightness and to see the general appearance of the aluminum bus bars in service. One of the 5 units in its metal enclosure was located for a period of 2½ years in the vicinity of the power house, where ammonia fumes periodically occurred. Examination of the silver plating showed normal tarnish and other discolorations on exposed areas, which is to be expected on silver plate. One connection bar was completely removed from the structure.

The contact areas were under the washers had not suffered any dishing due to creep of the bar. It was generally concluded that the silver plated aluminum was in excellent condition after its 2½ years of service. The high degree of maintained bolt tightness was gratifying.

The results of the silver plated aluminum bus bars in service is another significant step in the use of aluminum for electrical conductor applications. It again showed what has already been proven in the laboratory, that silver plated aluminum bus bar joints will satisfy the same temperature rise and joint resistance requirements as silver plated copper bus bar joints.



Copper - Tin - Zinc Plating

By J. B. Mohler, *Consultant*

AN alkaline-cyanide bath can be used to deposit a great many alloys that satisfy a wide range of demands for metallic coatings. Alloys with various combinations of copper, tin, and zinc are being deposited for decorative, protective, engineering and economic purposes. Specific alloys with high reflectivity and tarnish resistance are being used for decoration and protection of plumbing, interior trim and useful household items. Brass is being plated to obtain color and for rubber adhesion. Bronze alloys are used for undercoatings, stop-off for nitriding and bearing surfaces.

By the addition of minor amounts of alloying metals to a base metal the properties can be improved. Thus, copper and tin can be hardened to improve wear and abrasion resistance, and the corrosion resistance of zinc can be improved. By the addition of major amounts of a metal the properties can be completely changed. Speculum metal can be deposited with high hardness and excellent wear resistance that cannot be obtained with the single metals. By selection of an alloy it is possible to retain some of the characteristics of the base metal and combine these with the advantages of the alloy properties. Alloys can be produced with improved physical and chemical properties while retaining the buffability of copper, the solderability of tin or the corrosion protection of zinc.

The Alloys

Alloys can be selected to meet a combination of requirements. For a particular application it may be desirable for the alloy to be bright, hard, solderable and corrosion resistant. In another application toughness and anti-seizure may be important.

A number of alloys that have been deposited commercially are shown in Table No. 1 with a partial listing for general usage. The properties imparted by alloying correspond with what is expected from a knowledge of alloying by thermal methods. Additions of zinc or tin will increase the hardness of copper considerably and, in general, zinc may be substituted for a part of the tin without changing the properties greatly. When 38 percent of tin is alloyed with copper an intermetallic compound of high hardness is formed. That this takes place is evident from the fact that the alloy is exceptionally hard and white rather than pink, as would be expected with a solid solution, although it is possible to obtain a slow change in hue from white to bronze in alloys between 40 and 90% tin. A general knowledge of the properties of the commercial bronze

TABLE I

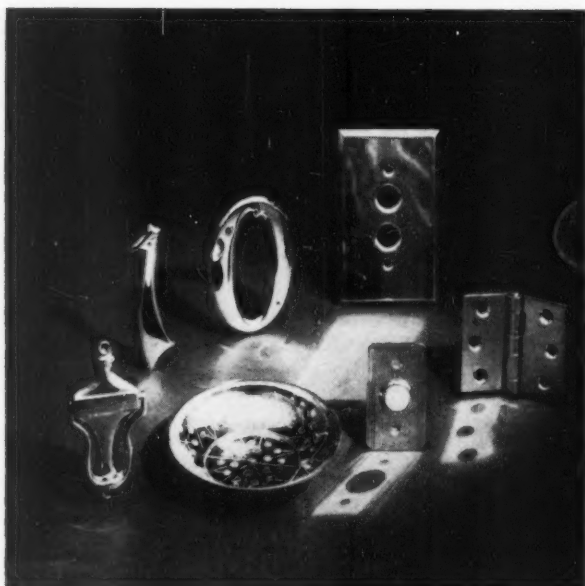
Alloy No.	Approximate Composition			Use
	Cu	Sn	Zn	
1	93	7		Bearing surface
2	80	20		Undercoating
3	60	40		Decorative
4	2	98		Bearing surface
5	92		8	Color
6	80		20	Color
7	75		25	Rubber adhesion
8	25		75	Decorative
9		80	20	Corrosion Resistance
10	55	30	15	Decorative

alloys is helpful to evaluate the electrodeposited alloys, but the comparison is only of general value. The metallurgist is concerned with castability and porosity due to gassing or shrinkage during solidification, characteristics not a problem to the plater. Also the metallurgist can exercise close control over his composition by analysis and addition of metal and he can develop the desired properties by additions of minor elements, control of casting conditions, cold working and heat treatment. Metallurgical techniques are of interest where bending, forming or annealing are employed, but alloy plating is a method with a number of advantages that apply particularly to plating.

BRONZE:

A bronze bath has been recently developed by Battelle Memorial Institute¹ for depositing alloys No. 1, 2 and 3. Such a bath can be used to plate alloys with various amounts of tin in the deposit by changing the bath composition. A relatively small amount of tin will have a marked effect on the hardness and the color of copper. The color and hardness will continuously change as tin is added until the hard white deposit of alloy No. 3 is obtained at approximately 40 percent tin. As the tin content is increased beyond this point the deposits become softer and take on more of the characteristics of tin.

Alloy No. 1 was found to be considerably harder than copper and yet to retain some ductility. If ductility is important, the alloy can be stress-relieved and softened by annealing at 700°F. The alloy has been used for high load bearing surfaces in pump applications, as a stop-off for nitriding and for electroforming dies for molding plastics.



(Courtesy Metal & Thermit Corporation)

Various parts plated by use of a bronze plating process.

Alloy No. 2 is harder than No. 1 but is still easy to buff. For decorative purposes, where both hardness and buffability are factors, this alloy is the compromise between copper and speculum.

Alloy No. 3 is one of several hard, white, bright alloys that are available for decorative purposes. Such an alloy was the subject of several patents issued in 1934.²

TIN ALLOYS:

Tin alloys containing small amounts of copper, such as Alloy No. 4, have been deposited for high speed bearings. For such applications a soft alloy is required. However, hardened tin alloys will perform satisfactorily at high speeds with the advantages of better wear and fatigue resistance as compared to pure tin. These alloys were deposited from tin fluoborate baths, but they can be deposited from the alkaline-cyanide baths. With the acid baths, deposition becomes difficult above 5 percent copper because of copper immersion plating troubles, both at the anode and the cathode.

BRASS:

A copper-zinc alloy known as bronze has been deposited for decorative purposes for many years.³ This alloy, containing 8 percent zinc, is preferred for decorative purposes where a bronze color is desired.

The terms bronze and brass are somewhat loose. To the metallurgist, bronze suggests copper-tin and brass is associated with copper-zinc. The copper-tin alloys generally are lower in alloying elements than brass, consequently the color of the red copper is not modified as greatly in the copper-tin alloys as in the copper-zinc alloys. The plater faced with the problem of matching the color of a cast bronze alloy turned to copper-zinc plating, which was available, to produce a bronze color. For a brass color he used baths that would deposit higher zinc contents, such as alloy No. 6.

Brass plating has been done for many years to obtain a desired color for decorative plating and metal trim. In many cases the bath is controlled for color rather than by the composition of the deposit. The plater

adjusts his bath to match a color standard which may consist of a piece of polished brass or bronze.

Alloy No. 7, used for rubber adhesion,⁴ is an example of very good control of an alloy bath. Since the composition is of importance for this application, much work on bath control has been done with the result that consistent results could be maintained without undue control methods.

White brass⁵ of the composition of alloy No. 8, is essentially a hard, brittle and bright zinc alloy that has been used for plating tools, novelties, toys, interior automobile trim⁶ and metal furniture.⁷

OTHER ALLOYS:

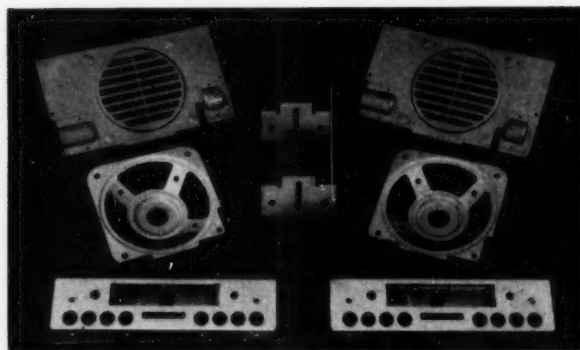
Alloy No. 9 was developed by International Tin Research Institute and has been used for plating tools, skates and machine parts in various industries.⁸ By the use of this alloy a unique compromise can be made between the corrosion properties of tin and zinc. Zinc gives corrosion protection because of sacrificial action, but the zinc itself corrodes. Tin gives corrosion protection because of good coverage and good corrosion resistance; however steel will corrode at any pores or breaks in the tin deposit. By the use of a zinc-tin alloy the corrosion resistance of tin can be combined with the corrosion protection of zinc.

Alloy No. 10 is a hard bright alloy developed by Westinghouse and introduced to industry with the cooperation of the Hanson-Van Winkle-Munning Company.⁹

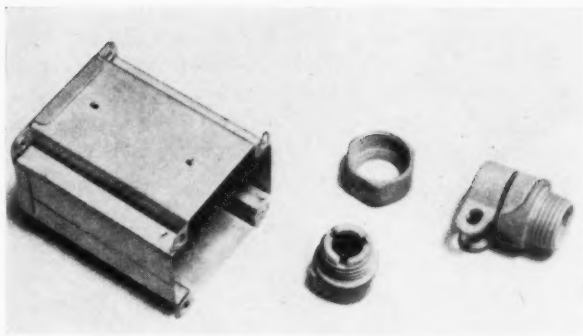
The alloys of Table No. 1 are standard alloys deposited for many applications from common and proprietary baths. The range of physical, chemical and metallurgical properties is so great that applications are possible in almost every phase of plating. When it is considered that intermediate compositions can be deposited, plus the fact that cadmium may be substituted for a part or all of the zinc, it can be seen that there is almost no end to the possibilities.

Alloy plating, just like the plating of the metals, becomes accepted after a bath has been developed, control methods have been established, the product has been tested, and standards or specifications have been set.

After a bath becomes commercial, there are certain advantages and disadvantages that become the concern of the plater. The plater is interested in economy, bath control, anode corrosion, plating rate, electrode efficiency, throwing power, bath stability, preparation for plating, and properties of the deposit, such as buffabil-



Electroplated Tin-Zinc Radio Components.



Electroplated Tin-Zinc Electrical Conduit Components.

ity, that may determine the time spent after plating.

Just as copper, tin, and zinc may be plated from many different baths, so may the combination of any of these metals be plated from many different baths. The possibilities are very limited with the acid baths because of the great difference in electrochemical characteristics of these three metals in acid solutions. However, it is probable that any combination can be deposited from alkaline-cyanide baths.

Alkaline-cyanide Baths

The tendency for metals to co-deposit can be anticipated by measuring the deposition potential.¹⁰ A practical estimation of the tendency to deposit can be made by consideration of the tendency of a metal to co-deposit with hydrogen. The alkaline and cyanide baths that deposit metals at cathode efficiencies less than 100 percent are likely to co-deposit metals if mixed. A study of the single metal baths and the alloy baths confirm that the variables that decrease the cathode efficiency in a single metal bath will suppress the deposition of that metal in an alloy bath. By such considerations it can be predicted that silver will deposit exclusively if a silver and a copper bath are mixed. However if a silver strike and a copper bath are mixed co-deposition is possible. If sufficient excess cyanide is present in such a bath the copper plating rate will be suppressed. These facts are known from the single metal baths and have been borne out by alloy plating experiments. Off-hand it would then seem that alloy plating from cyanide baths is quite simple. As a matter of fact, plating of many alloys is practical from cyanide baths, but it is not quite as simple as mixing two common cyanide baths. In the case of a silver-copper alloy made by mixing a silver strike and a copper strike it will be found that it is very difficult to continuously control the composition of the deposit. This corresponds with the fact that it is quite difficult to continuously control the cathode efficiency of a copper strike within narrow limits.

Another factor that must be taken into account is that of metal mixtures. Two metals may be co-deposited by adjustment of the electrode potentials but, if a metal mixture is formed, the alloy will be weak, banded or powdery. The successful alloys produced by co-deposition are those where the metals are compatible, where either solid solutions or intermetallic compounds are formed. It has been pointed out that lead does not fit into the copper lattice¹¹ and that weak and banded structures are obtained with copper-lead alloys when

appreciable amounts of lead are co-deposited with copper. Small amounts of lead can be co-deposited with copper and with silver to successfully form solid solutions, but many hours of experimentation with alloys of these metals containing high amounts of lead have demonstrated that the deposits were unsound.

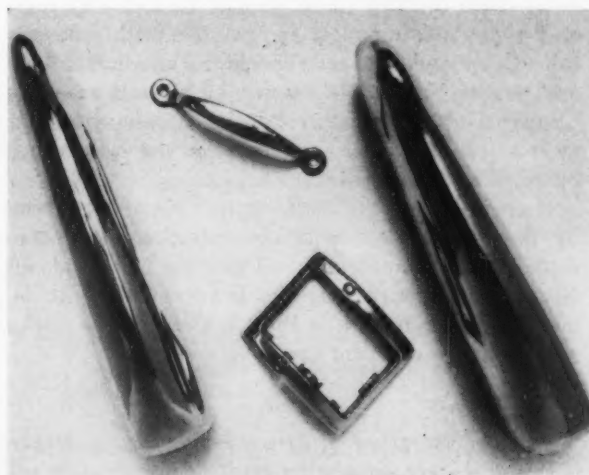
Small amounts of a substance that is not compatible with the base metal can produce an addition agent effect. This is obvious from the many examples of co-deposition of an organic substance like gelatine or of silver sulfide in a silver bath to make possible bright, heavy, sound deposits at higher plating rates. There are many examples of small amounts of metals producing a similar effect. It is also obvious that large amounts of metals have an addition agent effect. For example, it is much easier to obtain heavy deposits of bronze than to obtain heavy deposits of copper from a cyanide bath. This is probably due to the fact that the crystal structure is finer and broken up by co-deposition and apparently takes place in the solid solution range as well as in the two phase ranges.

Bath Control

Many a plating bath that would produce a desirable deposit has failed in the laboratory stage because the bath could not be controlled. An uncontrollable bath at the production stage can be very costly.

Alloy plating not only requires closer control but often presents new control problems. The anode problem in particular can be quite serious. If it is necessary to use dual anodes, or, if immersion plating of one of the metals takes place on the anodes, then bath balance becomes critical. The fundamental problems in the alloy bath are that balance has to be maintained with two metals at the same time and that the composition of the deposit is sensitive to the ratio of the metals in the bath. Also, chemical limits have to be established such that there is not too great a change in composition with change in current density.

For thin deposits or for flash plating, control will be less critical. For such baths the plating rate can be low, the baths will not be worked hard, and the quality standards for the deposit will not be as rigorous as for heavier deposits. It may be that alloy anodes will not be required or even that insoluble anodes can be used.



Electroplated Tin Bronze (80-20) Decorative Trim.



Electroplated Tin-Zinc Electrical Connector Components.

Alkaline tin baths have been operated for many years with insoluble anodes for flash plating. It is quite likely that zinc cyanide and sodium cyanide could be added to such a bath to produce a tin-zinc alloy.

In order to operate the bath continuously it will be necessary to control the following variables:

1. Metal content
2. Free cyanide
3. Free caustic
4. Temperature
5. Composition of Plate
6. Cathode Efficiency
7. Anode Efficiency

METAL CONTENT:

It will be necessary to control the metal content within determined metal limits. Control of the concentration of the metals along with the other variables will determine the composition of the deposit for a working bath.

If a high plating rate is desired, it can only be obtained by maintaining a high metal content in the bath. If the metal content is low, the cathode efficiency will be low. The metal content, however, is limited by the solubility of the chemicals. If sodium salts are used, the metal content will definitely be limited by the chemicals added plus the carbonate that will build up due to bath decomposition. Higher cathode efficiencies and higher plating rates are possible with potassium salts. Commercial copper cyanide and alkaline tin baths are popular in potassium formulations because, as compared to the sodium salts, the potassium salts are more stable, of higher solubility, and the baths can be operated at higher cathode efficiencies.

If good throwing power is desired it can be obtained by the use of low metal concentrations. The three metals we are considering will all drop in cathode efficiency as the current density is increased. With low metal concentrations this effect is particularly marked and results in excellent throwing power.

FREE CYANIDE:

The concentration of free cyanide has a marked effect on the copper plating rate. At low cyanide concentrations a high plating rate is possible, but a suffi-

cient excess of cyanide will stop the plating of copper. The other factors to be considered are that high cyanide concentration and high temperature will result in a more rapid decomposition to form carbonate.

FREE CAUSTIC:

Sodium or potassium hydroxide added to a bath will suppress the plating of tin and will increase the plating of zinc. Because of the use of alkaline compounds, high temperature and high concentration favor carbonate formation.

TEMPERATURE:

The plating rate of all the metals concerned can be increased by increasing the temperature. Temperature has the most marked effect on tin, and tin plating can be stopped by operating at a sufficiently low temperature.

COMPOSITION OF PLATE:

In any application there will be a desired composition for the deposit. It is only with long experience that the analysis of the deposit can be assumed to be in a specified range from the bath control data. In addition to the controlled variables, the plating rate is affected by uncontrolled variables, such as ammonia that is present due to cyanide decomposition. In operating a bath it will then be necessary to analyze the deposit and continuously make adjustments to maintain the desired control over the deposit. Of course, this is simplified where the deposit is colored and observation of the color indicates a shift in composition. Also, a plating range test will be helpful in that color indications may show up in the high or low current density areas of a test panel.

CATHODE EFFICIENCY:

In low metal concentration and sodium baths the cathode efficiency should be measured and logged. It may drop markedly as a fresh bath is used and it may increase if the bath is out of service for a time. Also, the change in cathode efficiency may be due to a greater change in the tin plating rate than in the other metals, with the consequence of a change in the composition of the deposit.

ANODE EFFICIENCY:

The anode efficiency will depend on the type of anodes and the bath. Copper anodes can be operated at 100 percent anode efficiency; polarized tin anodes may operate at 40 to 90 percent anode efficiency; and zinc anodes may be attacked chemically to operate at greater than 100 percent anode efficiency. Alloy anodes will approach the characteristics of the single metals depending on the alloy composition. Therefore, the least trouble will be expected with anodes high in copper and the most with those high in tin. If alloy anodes contain appreciable amounts of tin they will behave similar to tin anodes and close anode current density control will be necessary to maintain a polarized anode film.

In some bronze baths separate metal anodes have been used with a circuit to each set of anodes to maintain control over the rate of solution of the copper and the tin at a desirable solution ratio.¹² Although this has been done it is very troublesome and not a popular control method.

Various anode combinations and many anode control means are obviously possible. For a large installation, separate anode circuits or a regeneration system may be possible. For small practical baths there are other possibilities. If a high plating rate and a high cathode efficiency are required for such a bath, then soluble alloy anodes may be the only answer to maintain continuous control. However, if one of the alloying metals is to be deposited in small amounts, it may be controlled by chemical additions. A low cathode efficiency flash plating bath may be controlled by the use of insoluble steel anodes and chemical additions.

Applications

In addition to the applications mentioned and those that are unknown, there are many possibilities for alloys of copper, tin, and zinc alloys. Most of the new applications will take advantage of one of the alloys shown in Table No. 1. For heavy deposits of the first three alloys baths are available that contain copper cyanide and a soluble stannous pyrophosphate complex. Bronze anodes are used and heavy deposits can be obtained at good plating rates. In addition to the decorative, bearing, and stop-off applications mentioned, the bath has been used for salvage plating and for electroforming. Outdoor exposure data indicate that these and similar baths have good possibilities as a protective coating and as an under-coating.¹³

Much work has been done by International Tin Research and others on speculum and tin-zinc baths for decorative applications.

A sodium formulation was developed by International Tin Research for the tin-zinc baths. In order to obtain faster plating rates the Metal & Thermit Corp. developed a potassium bath¹⁴ that is being used for barrel, still and automatic plating. Many of the applications are in the electrical and electronic industries due to the fact that solderability and corrosion resistance are good.

Metal & Thermit has also developed a bronze bath (copper-tin)¹⁵ that may be plated either dull or bright.

The deposit may be used as a substitute for a copper undercoating. Good appearance, good color, good covering power and direct plating on die castings are among the advantages of the process. An interesting advantage of the process is the use of copper stannate to maintain the metal content after initial makeup of the bath. The use of this compound avoids the addition of unnecessary chemicals to the bath.

Several interesting baths that have been used for years were developed by the Special Chemicals Corp.¹⁶ Steel anodes are used for these baths and the baths are maintained by the addition of replenishing salts and adjustment of the pH and free cyanide. These baths demonstrate that practical plating can be done by the use of insoluble anodes and addition of chemicals to maintain bath control. The hard, white tarnish resistant alloy contains 62% copper, 13% zinc, and 25% tin. The deposit is used for decorative purposes, and as an undercoating for silver. Because the alloy is solderable and non-magnetic it is also used inside of electrical instruments. A 14 carat gold color is obtained in an alloy containing 69% copper, 29.6% zinc, and 1.4% tin. A low brass color is obtained in an alloy containing 89% copper, 9% zinc, and 2% tin.

Unusual applications may require new alloy compositions. If such is the case and standard or proprietary baths are not available, then the alkaline-cyanide baths offer the best possibilities. Enough is known about the copper-tin-zinc alloys so that characteristics of new combinations may be estimated. Also, the behavior of a particular bath may be predicted. With this knowledge available, a little imagination opens up many new possibilities.

Acknowledgement

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Surface Treatment and Finishing of Light Metals

Part VII. — Industrial Anodizing of Aluminum and Its Alloys

By S. Wernick, Ph.D., M.Sc., F.R.I.C., F.I.M. and R. Pinner, B.Sc.

This is the second installment of Part VII of the series by Dr. Wernick and Mr. Pinner. The first part appeared in the September issue.—Ed.

Effect of Operating Conditions

Any discussion of the effect of the operating conditions on the properties of the anodic coatings is complicated by the interdependence of most of the variables. Several of the basic properties are associated intimately with the rate of growth and the solvent action of the electrolyte, which not only determine the thickness of the coating but its porosity, its mechanical properties, and its chemical composition. Acid concentration, temperature, current density, voltage, and the type of current, all influence these properties and cannot generally be discussed separately.

In general, therefore, and particularly where the work is to be dyed, the operating conditions should be adapted to the alloy composition and the condition of the alloy and, where different alloys are treated, it may be necessary to install both heating and cooling equipment.

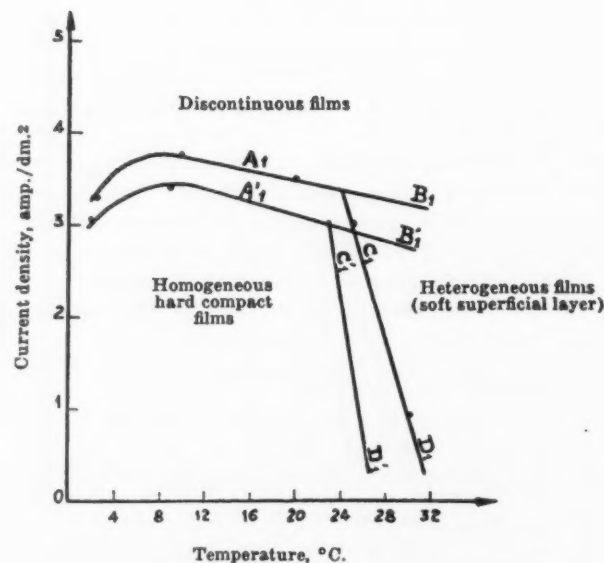


Figure 8. Conditions for obtaining homogeneous alumina films on unalloyed aluminum.

C_1, D_1, A_1, B_1 : limits relating to 10% by volume H_2SO_4 .
 C_1', D_1', A_1', B_1' : limits relating to 15% by volume H_2SO_4 .

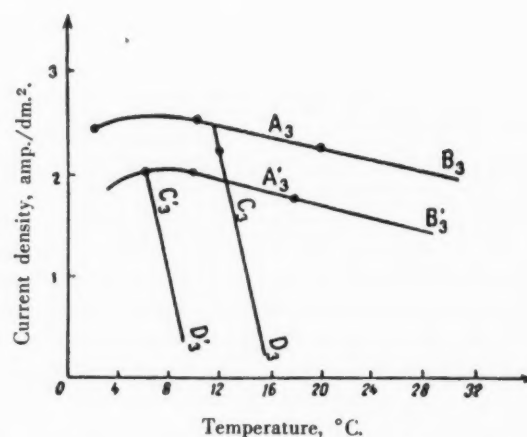


Figure 9. Conditions for detaining homogeneous alumina films on duraluminum-type alloy.

C_3, D_3, A_3, B_3 : limits relating to 10% by volume H_2SO_4 .
 C_3', D_3', A_3', B_3' : limits relating to 15% by volume H_2SO_4 .

The film thickness depends on the operating conditions, and the effect of operating time is well illustrated by experiments carried out on aluminum foil by Edwards.²² The total thickness of the foil, 1.14 mil. thick, was increased 42% by 60 minutes' anodizing.

In anodizing commercial aluminum at 80°F., McLachlin and Goddard²⁴ found that the thickness increased regularly in the first 50 minutes to 0.7 mil and remained constant. At 90°F. the curve flattened out at 0.4 mil, and at 100°F. at 0.25 mil. When alloys were anodized, the maxima were generally reduced, especially in the presence of copper, while magnesium- or zinc-containing alloys showed a decrease in thickness after reaching the maxima, requiring strict control of anodizing time.

Much light has been thrown on the effect of operating conditions in sulphuric acid anodizing by recent work in France by Herenguel et al and Lacombe and in America by Mason et al.

In investigating the effect of current density and temperature on the thickness of the coating, Herenguel and Segond showed the expected increase in coating thickness with increasing current density and drop in temperature after 45 min. in 10% sulphuric acid, the effect being rather more pronounced in the case of the Al-Mg alloy. The best region for anodic oxidation is given in Fig. 8.

Above the curve AB the film is too dense and has a

TABLE II

	Sulphuric acid concentration (%)	Temp. °C.	Time (min.)	Anode c.d. (amp./dm. ²)	Gain in weight (g.)	Elasticity (Bend angle)	Solubility of Al (g./dm. ²)	Voltage
1.	30	26	10	2	0.008	13.0°	0.048	8.8
2.	20	30	10	2	0.007	13.5°	0.049	9.6
3.	10	37	10	2	0.0015	14.0°	0.052	10.7
4.	20	20	10	1	0.01-0.012	15.5°	0.046-0.047	10.12

tendency to crack. On the right of CD soft superficial layers are formed. It should be explained that this diagram is for aluminum. The corresponding range for a duralumin type alloy is seen in Fig. 9.

The range for other alloys will vary with their composition. The soft surface layer is a typical case of film breakdown due to excessive temperature on a heavy metal. See Figs. 10 and 11.

The Coating Ratio

A useful concept in determining the course of anodic oxidation is the "coating ratio." This term was proposed by Mason and Fowle²⁶ and represents the weight of the coating, divided by the weight of the aluminum reacting (i.e. the combined weight of metal converted into oxide and going into solution).

Assuming that the coating is composed entirely of Al_2O_3 the coating ratio has a theoretical maximum of 1.89, i.e. if no metal goes into solution. In practice the anodic coatings nearly always contain the solution anion. In the case of sulphuric acid anodizing on 99.95% aluminum, approximately 12-14% SO_3 is found in the coating, which gives a maximum coating ratio of approx. 2.2.

From the foregoing discussion on the effect of the operating variables it follows that, other conditions being constant, the coating ratio will decrease with time and can be increased by reducing the bath temperature and acid concentration or by increasing the current density and voltage. It can also be increased by certain additions such as oxalic acid.⁴¹ The way the coating ratio is influenced by some of these variables has been shown in a detailed investigation by Mason and Fowle.²⁶

In Russia, the chromic acid processes first developed were later largely replaced by sulphuric acid²⁷ and interesting experiments were carried out by Akimoff, Tomashov and Tukina^{28, 29} in attempts to cut down the operating times without loss of film properties. These authors found that decrease in elasticity, adhesion and corrosion resistance of the film caused by shortening the treatment time could be balanced by raising the



Figure 10. Soft surface layer obtained by anodic oxidation of aluminum at excessive temperature, revealed by gentle scraping.

current density and temperature. Increase in solubility of the aluminum could also be counteracted by increase in current, temperature, or acid concentration.

The authors measured the elasticity of the coatings by determining the angle to which the film could be bent against a round object before cracking, and the

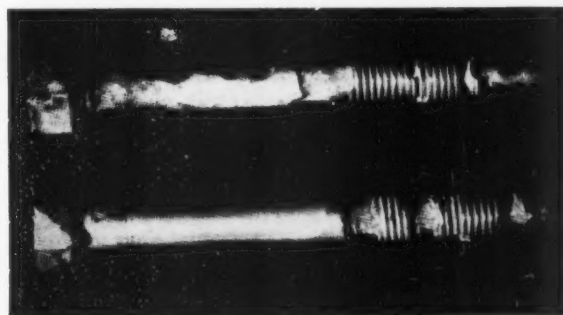


Figure 11. Film breakdown caused by anodic oxidation of an aluminum-zinc-magnesium-copper alloy at excessive current density.

solubility from the change in weight of the specimens. The corrosion resistance was determined by Rohrig and Lux's methods,³⁰ by which the time is measured until drops of an aqueous solution containing 3% potassium chromate and 25% hydrochloric acid (sp. gr. 1.16) placed on the surface turn green.

In their attempts to accelerate the process, the authors investigated four modifications of the sulphuric acid process, given in Table II.

The process recommended by these authors is to begin with the concentrated solution and work it with change in operating conditions until the lowest acid concentration is reached. The operating conditions can be varied, however, for special film properties required.

The same author²⁹ describes a process developed for the production of thick coatings for use in engine construction. As has been stated, coatings of above 50μ cannot be obtained by the normal procedures. When, however, the solubility of the film in the electrolyte is reduced by lowering the temperature, films of up to 250μ can be obtained with a metal loss of only approximately 0.3 g./dm.².

Such films are used where maximum wear resistance and heat insulation is required and are useful also for their ability to absorb and hold oil in cylinder heads, pistons, etc.

When films are to be dyed, the temperature of the bath is frequently raised to approximately 35°C. This has the result of increasing the solubility of the film in the electrolyte, and hence the porosity of the coating. The effect of temperature and anodizing time on the dyeing properties is seen in Table III.

TABLE III

Anodizing time (min.)			Appearance after dyeing
95°F.	110°F.	125°F.	
30	—	—	Light grey
60	30	—	Dark grey
90	60	30	Fair black
120	90	—	Medium black
150	120	60	Jet black

Impurities

The first losses in the course of working a sulphuric acid bath are made good by additions. With increase in aluminum content to approximately 0.2%, the current density at constant voltage first increases slightly but then begins to fall off, until the bath is discarded either wholly or in part.

As an alternative to a quantitative determination of the aluminum content, Schenk⁶ describes a method in which a test-piece of aluminum is anodized at constant voltage and the current density determined after a standard time. Thus, working at 15 volts at 20°C. in 20 to 25% sulphuric acid, the current density after five minutes should be between 14 and 27 amp./ft.². Variations from this value point to exhaustion of the solution or the presence of impurities. Chloride must be excluded; above 0.1% Cl⁻, etching takes place. Copper and silicon dissolved from the alloys are common impurities. The latter is in suspension and, with lack of filtration, may precipitate as a brown powder on the anode. Oil or grease, which commonly enters from insufficiently cleaned air used in agitation, prevents film formation and gives rise to local etching. Oil adsorbed into the coating may also cause staining or prevent uniform dyeing. Schenk lists the maximum permitted impurities in the sulphuric acid used for making up the bath as: Fe⁺⁺⁺ 0.03%, Pb⁺⁺ 0.005%, Al⁺⁺⁺ 0.001%, NO₃⁻ + NO₂⁻ 0.002%, Cl⁻ 0.005%.

Chromic Acid Processes

The first chromic acid process was developed in Britain by Bengough and Stuart in 1923, and this as well as later modifications, including a standard specification³¹ are still in extensive use.

CLEANING:

The work is cleaned by vapor degreasing and, where necessary, is given an additional alkaline cleaning treatment, e.g. a 6- to 8-oz. per gallon mixture of tri-sodium phosphate — sodium meta-silicate³¹ at 90°C. Where the work will stand it, shotblasting or scratch-brushing may precede cleaning. After a final rinse in clean running water, the work is ready for anodizing.

ANODIZING:

The work may be treated either on racks, or in perforated baskets. Contact points must be stripped each time; alternatively, the coating may be pierced by a pointed spring clip. The initial solution consists of 2.5% chromic acid. The acid used should be pure, i.e. contain not less than 99.5% CrO₃ and less than 0.02% Cl. In any case, the chloride content of the solution should not exceed 0.02% NaCl. As aluminum is dissolved, the bath is regenerated with chromic acid addi-

tion, and this can be continued to a total chromic acid content of 10%.

The temperature of the bath is kept at 104°F. $\pm 4^\circ$ (40°C.). The temperature is thus fairly critical, and thermostatic control is desirable. There should be continuous filtration of the solution and moderate agitation, either by air or anode-rod movement.

Where riveted tanks are used as the cathode, contact is made at several points. The tank should be constructed of stainless steel. As mentioned above, however, the use of separate cathode is best. The cathode:anode ratio is not critical, but should preferably be from 5:1 to 10:1. To cut down the cathode area when the tank is the cathode, parts of the bottom and walls may be insulated with glass.

VOLTAGE CYCLE:

The voltage cycle in common use today is as follows: The voltage is raised gradually from zero to 40 volts in 10 minutes, held constant at 40 volts for the next 20 minutes, slowly raised to 50 volts over the next five minutes, and kept at 50 volts for a further five minutes. The total time is, therefore, 40 minutes.

In treating aluminum-alloy castings, this cycle is further modified, especially where a high copper-containing alloy is treated. In this case the temperature is reduced to 25 to 30°C. and the voltage is raised in eight steps of 5 volts from zero to 40 volts within 10 minutes and held constant at 40 volts for the next 30 minutes. After anodizing, the work is rinsed in cold water, then in hot water and dried.

As has been seen, the current is controlled by the voltage, and the cycle must be adhered to strictly in order to avoid etching. The original Bengough-Stuart cycle, which took 60 minutes is, however, no longer in extensive use. The average current density over the 40 minutes is approx. 3 to 4 amp./ft.².

Because of the complex voltage cycle, arrangements for making the equipment automatic are difficult. To facilitate easier batch working, however, power sources have been developed with automatic voltage control, fitted with a timing device, to suit the cycle employed.

The Bengough-Stuart process cannot be used on alloys containing more than 5% copper, but is especially suitable for work with rivets, joints, etc., which is difficult to rinse, as chromic acid residues are not harmful to the corrosion resistance of the metal.

The Bengough-Stuart coating is thin (averaging 2 to 5 μ) and is relatively softer than those produced by other processes. The coating contains only a little chromium, and the average current consumption of the film is 0.2 kwh./ft.² of surface. The corrosion resistance of the film is excellent relative to its thickness, but the abrasion resistance is poor and the film is easily injured. The color is more or less dark grey, depending on the composition of the basis metal, and does not dye well. Compared to the other processes, the corrosion resistance of the chromic acid film is superior in the unsealed condition but inferior to sealed, sulphuric acid coatings. The chromic acid coating is not sealed, due to its low porosity. For the same reason, the dissolution rate of the coating is high compared to the growth rate and, while the limiting film thickness is low, the metal usually loses in weight by anodizing.

TABLE IV³²

Chromic Acid Content	Voltage	Current Density	Time	Temp. °C.	Apparent Current Efficiency Al Removed*	Al ₂ O ₃ Formed
3%	Bengough-Stuart cycle	3 amp./ft. ² (average)	60 min.	40	102.0	45.9
9%	40 v.	3 amp./ft. ²	30 min.	30	101.8	52.2

*The figure for aluminum removed in the table is greater than 100 due to chemical dissolution of aluminum, confirmed by the gas analysis figures mentioned earlier.³³ The weight of the film only accounts for 60 to 80% of aluminum lost while 20 to 40% is dissolved.

Accelerated Chromic Acid Process

This process was developed in the U. S. A. by the Bureau of Standards^{34,35} in an attempt to work out a process which would work at constant voltage, and to avoid rapid exhaustion of the solution. It was found that, at a chromic acid content of 5 to 10%, the Bengough-Stuart cycle is not required but a constant voltage of 40 volts may be employed at much reduced treatment time. Table IV gives the relationship between treatment time and current efficiency of the process.

The current efficiency of course decreases with time, until the limiting film thickness is reached, where the rate of growth is equal to the dissolution rate.

The change in dimension produced on three aluminum alloys by the accelerated chromic acid process was determined by Edwards and Keller.³² The alloys were 2S-O, 24ST and 195T-4 (the latter being a heat-treatable Al-Cu casting alloy) and were treated in 8% chromic acid solution at 35°C., 40 volts for 30 minutes. The same treatment produced coatings of 0.00014" on 2S-O, 0.00012" on 24ST and 0.00010" on 195-T4. The changes in the diameter of the test-piece anodized varied according to the alloy and the position on the test-piece, but in no case exceeded 0.00008".

The coatings produced by the accelerated process may be sealed in hot water at 180 to 200°F. or, alternatively, may be dyed and subsequently sealed in nickel acetate (0.4 oz./gal. at pH 5.0).

During an investigation of the impurities in chromic acid solutions Buzzard and Wilson found that chloride present in the electrolyte causes etching, while the chromic acid was exhausted mainly by neutralization with dissolved aluminum. The hexavalent chromium content, which is called the *free* chromic acid content, decreases with time, while trivalent chromium and aluminum content increase, the former being formed by cathodic reduction. To avoid this, the cathode area should be kept down as far as possible. When the free CrO₃ content is low, the corrosion resistance of the coating is low and a brown deposit consisting probably of an aluminum or chromium chromate settles out at the bottom of the tank. In the presence of trivalent chromium, the dissolution of the aluminum is retarded. The optimum operating conditions depend on this dissolution and, hence, on the *free* chromic acid content. Attempts have been made to rejuvenate the electrolyte by anodic oxidation of the trivalent chromium as is done in chromium plating.

The solution is electrolyzed between lead anodes and iron cathodes, at 2.5 amp./ft.² for 24 hours or until the pH drops from 1.5 to 0.2. According to another account³⁶ the anode:cathode area ratio should be 40:1

while the anode area should be within the region of 0.5 to 1.0 sq. ft. per gal.

D. Jackson³⁶ has studied the effect of sulphate content in the Bengough-Stuart chromic acid bath and has found that the color of the coating varied significantly with the amount of sulphate present. Thus, while a semi-opaque film is formed at less than 0.01% H₂SO₄, opaque films formed at between 0.01 to 0.03% H₂SO₄ go over to transparent coatings above 0.03% H₂SO₄.

In practice, the sulphate may come from hard water and, although anodizing is possible up to a sulphate content of 0.5% H₂SO₄ it is inefficient and the water supply should henceforth be tested and measures taken to soften it if necessary. The life of the chromic acid solution is shortened in the presence of sulphate, as in its absence an insoluble film of chromium dichromate is formed on the cathode⁷³ which is permeable only to the small hydrogen ion, and hence permits the liberation of hydrogen without reduction of the Cr₂O₇⁼ ion, which is too large to diffuse through the film. The presence of the bisulphite anion facilitates dissolution of this cathode film and increases reduction of the hexavalent chromium. Provided, however, the cathode current density is large enough (i.e. the cathode area is small), the influence of the sulphate ion is negligible. In this way, Tarr, Darrin and Tubbs³⁷ worked with cathodes of only 2% of the anode area (using high chromic acid solutions) and obtained coatings of similar weight of Al₂O₃ (i.e. similar anode efficiency) as with cathodes 20 times the anode area.

To precipitate sulphate from the solution, barium hydroxide or carbonate may be added as in the case of chromium plating solutions. As the precipitate does not as a rule interfere with anodizing, it is often allowed to remain at the bottom of the tank. In the precipitation it may be assumed that 1 lb. of barium hydroxide reduced the sulphate content of 100 gallons of solution by 0.2 g./l. This will, however, depend in some degree on the chromic acid content as barium chromate may partly precipitate. For this reason, if the precipitate is to be removed, time should be allowed for barium in chromate form to be converted into the less soluble sulphate before decanting the solution.

Modified Process

The effect of sulphate in chromic acid solutions, however, is not necessarily detrimental. Slunder and Pray³⁸ describe a modified chromic acid process which was employed during the wartime shortage of chromic acid.

In the normal high chromic acid bath chromic acid is consumed, as only approximately half the Al₂O₃ formed by electrolysis remains, the remainder being dissolved, neutralizing the free chromic acid. In this

way it has been stated that 90% of the chromic acid consumed is used to neutralize dissolved aluminum and to maintain the pH.³⁹

The decrease in efficiency is shown by a rise in pH and a drop in the current density at constant voltage. Ordinary additions of chromic acid build up the chromium content and, after a time, the bath is exhausted and is either entirely discarded, or replaced in part. The latter method being preferable as it enables a constant pH and chromium content to be used. In the modified process, on the other hand, though the bath initially contains chromic acid only, the pH is maintained by additions of sulphuric acid. The tanks used in this process must be protected against corrosion. Lead lined tanks are suitable, while carbon cathodes have been employed.

Slunder and Pray worked with a stock solution containing:

Hexavalent chromium	50.3%
Trivalent chromium	0.3%
Aluminum oxide	14.8%
Sulphate	4.7%
pH	1.0%

to which varying amounts of aluminum sulphate were added.

While in the case of 24ST, sulphuric acid additions can be made by time alone, the relationship is more complicated in some other alloys, as the sulphate content increases. At constant pH, variations in sulphate content may cause pronounced changes in the current density-voltage relationship and, in practice, the thickness of the film is controlled by maintaining the operating conditions to give a constant anode current density rather than by maintaining constant operating conditions. This is usually done by changing the pH or the bath voltage as the sulphate content increases.

The variation in the current density/voltage relationship with sulphate content means that different alloys cannot be anodized at the same time, unless the voltage is kept down to 15 to 20 volts. The coatings are transparent and have the appearance of d.c. sulphuric acid films.

Regeneration and Disposal of Anodizing Solutions

As the anodizing bath is used, the aluminum content of the solution will rise and there may also be an unwanted rise in the trivalent chromium concentration. Rise in aluminum content may be countered by addition of chromic acid according to the free chromic acid content measured by the titration value, which should not be allowed to fall below 3 except when the solution is about to be discarded, when it may fall as low as 2. Once the total chromic acid concentration has exceeded 10% by weight the voltage required to use the bath becomes excessive and the corrosion resistance of the coating may suffer. In practice, the bath will have to be discarded unless it is regenerated.

Regeneration can be carried out by means of cation exchange and is usually well worth investigating if the bath volume is above approximately 300 gallons. The economics of cation exchange regeneration have been discussed in a number of articles⁴²⁻⁴⁵ and, particularly in the case of larger plant, have often been spectacular, while an additional advantage consists in

the closer control on the anodizing operation facilitated by operating at a constant aluminum content.

Chromic acid anodizing wastes may create a disposal problem whose seriousness will vary with local regulations. In many cases, it is essential to extract the chromic acid from the wastes before these are passed to the sewer and, in some cases, the chromic acid may be removed for re-use.

A number of methods have been devised for treating chromic acid containing wastes including (1) reduction by ferrous sulphate, sulphur dioxide and sodium metabisulphate, barium sulphide, iron and zinc,⁴⁶⁻⁴⁸ (2) precipitation with barium chloride or hydroxide,^{49,50} (3) evaporation to a small volume,⁵¹⁻⁵³ and (4) by anion exchange.⁵⁴⁻⁵⁷ A full description of all these methods has been given elsewhere.⁵⁸ While choice of method must be made according to individual conditions the anion exchange has the advantage of being perhaps most easily combined with the systems described earlier.

Sulphuric acid anodizing solutions may be regenerated by extracting the aluminum and other metals introduced in aluminum alloys though, in practice, the low cost of the electrolyte will not normally make this economic. If regeneration is required, the metal may be precipitated as aluminum alum by adding ammonium sulphate and cooling.⁵⁸ Alternatively, the sulphate of an alkali metal may be added. By this method the life of the solution is prolonged, possibly by sequestering aluminum as a complex salt.

Comparison Between Sulphuric and Chromic Processes

The relative advantages of the two processes can be summarized as follows:

Cost — Both in cost of chemicals, length of treatment, heating and power costs, the sulphuric acid process is by far the less expensive.

Automatic Equipment — Both the sulphuric acid and the modern high chromic acid solutions may be worked automatically, for which the Bengough-Stuart process, which requires varying voltages, is not suitable.

Alloy Composition — The majority of alloys can be treated satisfactorily in sulphuric acid. Alloys containing above 5% heavy metals or substantial amounts of silicon cannot be satisfactorily treated in chromic acid.

Shape of Work — Work with laps, joints or recessed parts should not be treated in sulphuric acid due to the corrosive nature of acid residues. Chromic acid residues, on the other hand, are beneficial by virtue of their inhibiting properties.

Protection — Chromic acid coatings do not require sealing and, in the unsealed condition, are more corrosion resistant than sulphuric acid coatings. The latter are, however, generally superior after sealing in hot water or dichromate solutions. Again, chromic acid coatings are relatively thin and soft and cannot be used where wear resistance is required.

Appearance — The grey color of chromic acid coatings is generally unattractive and only dark shades are obtainable by dyeing. The sulphuric acid coatings are clear and transparent, and may thus be applied to pro-

(Continued on page 60)

Getting the Most Out of Centrifugal Pumps

By Eugene Brooks, Engineer, The Deming Co., Salem, Ohio

INSSTALLATION of the right pump for any application is absolutely necessary for efficient operation at lowest possible cost, no matter how carefully the pump is maintained. In the case of pumps used in metal finishing operations, such as cleaning, degreasing, pickling, plating, rust-proofing or phosphate coating, careful pump maintenance and repair takes on special significance. Caustic alkali solutions, hot organic solvents and the various acids and plating solutions create peculiar pump maintenance problems. These problems must be solved permanently if the economy of continuous assembly and processing is to be maintained on today's fast-moving production lines.

After the proper pump has been selected and delivered, the installation and operation instructions supplied by the manufacturer should be read and followed carefully. These instructions are mostly based on the standards of the Hydraulic Institute and represent the accumulated experience of the pump industry over many years. While they cover most problems encountered in installing and operating pumps, the various items concerning maintenance and repair require some elaboration.

Stuffing Boxes

As long as the pump produces the required output, the maintenance consists only of attending to stuffing boxes and bearings. The stuffing box can be compared to a closely fitted bearing which, in order to operate satisfactorily, must have a straight, smooth shaft running in its exact center. This shaft must be lubricated and cooled either by drips from a liquid or by some other means of lubrication.

A slight leakage from the stuffing box is normal when conventional asbestos graphite type of packing is used. Maintenance men frequently regard the leakage as a pump failure, and they may draw the stuffing box glands up tighter to eliminate the dripping. Without this minimum leakage, however, the shaft will score in the boxes and within a short time the shaft will have to be replaced. Where the fluid being pumped is inexpensive, such as plain water or a highly diluted alkali or other cleaning solution, and the slight leakage can be readily disposed of it is more economical to allow this normal leakage than to replace pump shafts or shaft seals frequently.

If the stuffing box stays reasonably cool and does not leak excessively, its operation should be considered satisfactory. If the box heats and excessive leaks cannot be stopped by tightening the packing, it is well to stop the pump and to check up on the points enumerated in the manufacturer's maintenance instructions. To repack, the stuffing box and sealing rings, as well as the water-seal passages, if any, should be cleaned and new packing installed according to the

manufacturer's instructions. This is the general procedure: When starting the pump, considerable leakage should be allowed; and, above all, heating prevented, since this would melt the lubricant out of the packing. After sufficient wearing in time — usually from one to two hours, the packing will have formed a proper seal around the shaft, the temperature will be down and the leakage not excessive. The latter two conditions indicate that the stuffing box is working satisfactorily.

A number of pump manufacturers now use a type of bulk packing to prevent scoring pump shafts. It is a mixture of lead, cellulose and graphite, and looks like a carbon-graphite bushing after having been in use. In one automobile assembly plant, this packing has greatly increased efficient operating life of pumps used in degreasing and cleaning body parts. Previously, the stuffing box trouble required replacement of the pump shaft or shaft sleeves every 3 or 4 months. After using the packing, the same pumps operated efficiently for 10 to 12 months before they were torn down for other repairs. At this time there was no sign of undue wear on the shaft.

Instead of a packed stuffing box, mechanical seals may be used to prevent shaft leakage, but only with certain fairly clear liquids. These devices consist of a stationary part and a rotating seal which are under sliding contact with enough pressure to seal off the fluid pumped. The shaft is sealed off by packing or rubber sleeves. Although successful on fluids which are free of grit and contain some form of lubrication, the mechanical seals have not been proven for gritty fluids, such as a recirculating degreasing solution, or for non-lubricating fluids. At present, mechanical seals are not yet accepted as a substitute for packing in all cases.

Perhaps the most practical solution to the stuffing box problem is the installation of a submerged type pump for circulating cleaning and coating solutions sprayed on assembly line products. This type of pump requires no stuffing box. Mounted vertically directly over the tank of liquid it circulates, the pump will leak back into the tank, preventing loss of an expensive coating solution. Another advantage is that no extra floor space or expensive foundations are needed since these compact pumps use only a small space on the circulating tank cover. In contrast, the horizontal centrifugals must be installed on or under the floor to be on a level with the tanks.

Bearings

Common to most pump types, however, is another troublesome maintenance problem — bearings. Two types of bearings most frequently used are sleeve bearings and ball bearings. The sleeve type bearing is

placed close to the impeller and is submerged in the liquid being pumped. If the liquid is free of gritty particles it serves as a lubricant between the pump shaft and the bearing surface.

However, if the pumped liquid is not clean, a flow of clean water is piped to the center of the sleeve bearing. Most pumps are equipped with a removable plug for introducing water to lubricate this type of bearing. Maintaining this flow of water at a pressure higher than the head developed by the impeller lubricates the bearing and excludes any gritty particles from the lubricating fluid. In using this type of lubrication, it is necessary that dilution of the pumped liquid be unobjectionable, since the lubricating water is forced through the pump discharge.

Ball bearings are gradually replacing the sleeve bearings made by pump manufacturers. The two main points of ball bearing maintenance are: keeping out the water or corrosive solution, and proper, *but not surplus* lubrication. Most pump manufacturers include instructions for the proper lubrication of bearings with each pump delivered. The proper time interval between regreasing depends upon the speed and size of the bearing and its temperature while the pump

is operating. No general rule will cover bearing lubrication for the many pump uses, but regular inspection of bearings should be a part of standard pump maintenance. Many times maintenance men will overgrease ball bearings in pumps to "make sure" they have adequate lubrication. Actually, the surplus grease prevents the proper dissipation of heat from the bearing. This results in the grease packing around the bearing and inevitable mechanical failure.

Standards for ball bearing lubrication are issued by ball bearing manufacturers in cooperation with the oil companies. These standards, along with the pump manufacturer's maintenance instructions, should guide maintenance personnel in the proper care of pump bearings.

Pump Repair

When the performance of a centrifugal pump drops below its requirements, the pump must be refitted with new parts to assure the output necessary to meet the demand. However, many symptoms of poor performance can be due to less serious causes. The following outline will be helpful in locating the causes of common performance troubles:

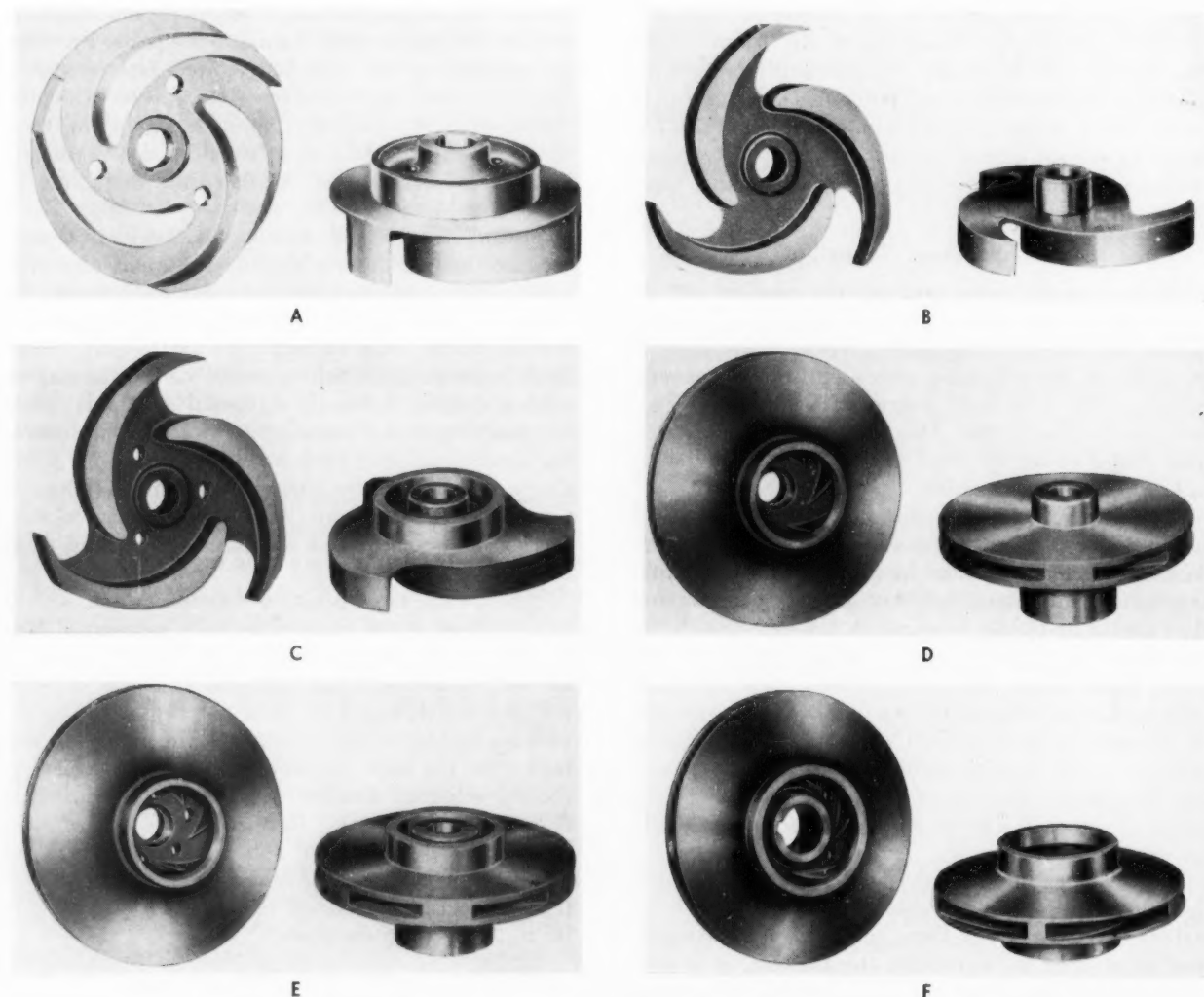


Figure 1. Typical impellers for centrifugal pumps.

A—Semi-enclosed or semi-open impeller with sealing ring on back. B—The most common and simplest open type impeller. C—Same open impeller as B except for sealing ring on back. D—Single suction enclosed type impeller with sealing rings on suction side as well as on opposite side. E—Another single suction enclosed type except that sealing ring is on suction side only. F—Symmetrical double suction enclosed impeller with sealing rings on both sides.

Locating Trouble

NOT ENOUGH WATER DELIVERED:

- Discharge head requirements higher than anticipated.
- Suction lift too high.
- Not enough suction head or submergence for hot water.
- Suction or discharge piping too restricted.
- Air leaks in suction pipe or stuffing box.
- Mechanical defects.
 - Impeller worn or damaged.
 - Casing worn.
- Wrong direction of rotation.

NOT ENOUGH PRESSURE:

- Speed too low.
- Air or gas in liquid.
- Piping too small.
- Impeller diameter too small.

PUMP WORKS FOR A WHILE AND THEN QUILTS:

- Leaky suction line.
- Waterseal plugged.
- Suction lift too high.
- Air or gas in liquid.
- Not enough submergence.

PUMP TAKES TOO MUCH POWER:

- Speed too high.
- Head lower than rating, pumps too much liquid.
- Liquid either more viscous or heavier than anticipated.
- Mechanical defects.
 - Shaft bent.
 - Impeller binds in casing.
 - Stuffing box too tight.

In any of the above cases where inspection indicates that worn internal parts of a centrifugal pump are causing reduced performance, new parts should be installed and a general pump overhaul should be performed. The pump should be dismantled, cleaned, and inspected carefully in a regular procedure such as the following:

1. Ball bearings are removed from the shaft and washed with clean kerosene. If inspection shows that they are still usable, they are coated with oil and wrapped in clean rags or paper until they are re-installed on the shaft. Ball bearings must not be left lying around unprotected on work benches, because dust and filings will ruin the bearing surfaces.

2. Shaft and sleeves (if any) should be inspected for wear and scratches where shaft passes through packing. Shallow scratches can be removed by polishing or grinding. Deep scratches and grooves call for new parts.

3. Impeller and casing are inspected next.

Impeller Types

To properly inspect and refit impellers, it is necessary to recognize the peculiar features of several types of impellers used in centrifugal pumps. Illustrated are various types of the three general classes of impeller used in centrifugal pumps — open, semi-enclosed (or semi-open) and closed.

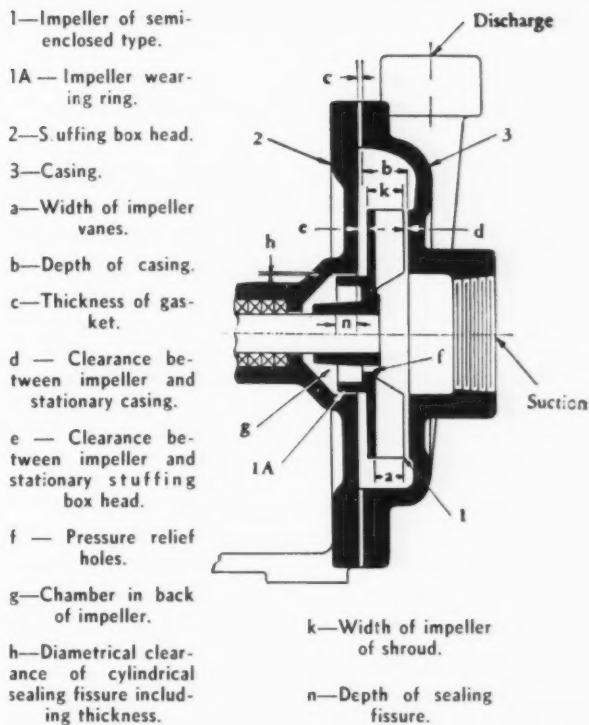


Figure 2. Details of pump and clearances around semi-open impeller and sealing ring.

In Fig. 1 the vanes of impellers A, B and C produce a wiping action on the face of the casing. This type of impeller is preferred for fluids containing solids, such as degreasing compounds removing grit and grease from heat treated or machined metal parts. Types D, E and F are used for clear liquids. The sealing of the pressure developed by the impeller is taken care of, in various manners, by the different designs. Some incorporate wearing rings which fit closely into the casing. Others seal the discharge space of the pump from the suction space in axial direction by letting the vanes of the impellers rotate close to the wall of the casing.

The centrifugal pump with semi-open impeller and volute casing is frequently used for pumping clear or muddy liquids at discharge heads up to 75 pounds. Details of the pump design and construction are indicated in Fig. 2.

Impeller seal consists of impeller wearing ring (1A) rotating in casing with clearance (h). If on inspection this clearance is found to be over 0.005" to 0.010" on small and medium size pumps, new parts should be installed. The front clearance (d) should be between 0.002" and .005". This clearance (d) can be varied by moving the impeller, provided axial adjustment is possible in the bearings.

This adjustment made at the bearing is a great convenience to the assembler at the factory, since it enables him to quickly put the impeller in the required position. When there is excessive clearance between the impeller and the casing, a large part of the pumped liquid naturally returns towards the suction, and the output and efficiency are greatly impaired. For average conditions the adjustment should not be tampered with in the user's plant. The manufacturer or installer

should be consulted. However, the adjustment procedure is simple and, if a possible maximum is desired, trained plant personnel can make the change. For best results, the adjustment should be made while the pump is running.

All ball bearings (except for special applications) have a certain amount of end play and, therefore, when the pump is operating and under load, the shaft will shift its operating center a few thousandths of an inch one way or the other. Construction makes possible a hairline adjustment. By means of a pressure gage and instruments for reading the power consumption, the best operating setting can be determined. Enlarged clearances resulting from wear of the impeller vanes or casing face, or both, can be reduced by re-adjustment of impeller.

When the pump delivers in excess of requirements, adjustment can be made by partial by-passing. This method of reducing capacity is less detrimental to the efficiency than the customary throttling by valves.

Refitting of the rest of the impeller types (Fig. 1B to F) can proceed as follows:

Fig. B — Fully open impeller. Front and back seal depends on axial clearance of impeller between casing walls. Clearance is reduced by removing shims between casing halves.

Fig. C — Same as B, except that back sealing ring must have proper clearance in casing.

Fig. D — Sealing depends on proper clearance of 2 sealing rings. This style does not require axial adjustment.

Fig. E — Same as D.

Fig. F — Same as D.

Pump Alignment

After the pump has been refitted and reinstalled, even if the original alignment of pump, piping and motor was satisfactory, the alignment should be rechecked before starting the unit. If the proper alignment is not maintained, pump operation causes undue wear at the coupling, as well as the bearings in both the pump and motor. The following alignment inspection procedure should be a part of regular pump maintenance.

With vertical, horizontal and angular alignment no strain is transmitted to the pump. When perfectly aligned the rotating element of a pump should turn freely without binding and should show no bright spots.

The vast experience of pump manufacturers in producing centrifugal pumps for metal finishing applications has been the result of cooperative efforts among pump makers, producers of continuous cleaning and coating equipment, and the manufacturers of automobiles, appliances and many other fabricated metal products. Engineers of these firms work constantly to develop better pump designs to increase operating efficiencies and lower operating costs. The benefits of their experience and studies can be fully realized only when responsible personnel carry out thorough pump operating maintenance programs regularly and faithfully.

SURFACE TREATMENT

(Continued from page 56)

text decorative finishes, while they are excellently suited for dyeing.

Dimensional Change — Less aluminum is dissolved in the Bengough-Stuart process and, where it is necessary to work to small tolerances, this process is superior to both sulphuric and high chromic acid processes.

Mechanical Properties — Under conditions of stress, the mechanical properties are largely unaffected by the chromic acid coating, while fatigue properties may be slightly improved. The bending properties of thin sheets are also not affected as much as by other processes.⁵⁹

Equipment — Chromic acid baths require better exhausts because health hazards are greater than in the use of sulphuric acid. The latter, however, require acid resisting tank materials and separate anodes.

(To be continued next month)

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Finishing Pointers

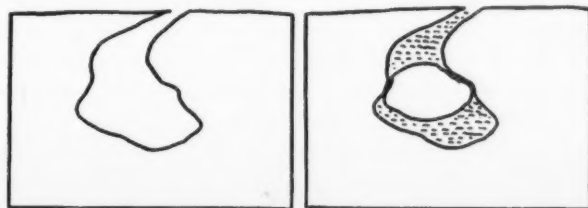
Spotty Plating

A PROBLEM that occasionally arises is that of spotty plating. Spots on the plated surface can be due to trouble in the bath, such as loss of bath control, or due to dissolved gases or the presence of oil. Spots can also be caused by porosity of the basis metal.

If spots are due to bath troubles they will be apparent as the work leaves the plating bath. If spots show up after the rinse or, if they develop or get worse with time, then they are generally due to porosity. Examination under a low power microscope may reveal the pores. On the other hand, they are often difficult to find because they have been partially closed at the surface by working of the metal in a machining or buffing operation.

The pores may sometimes be closed by a burnishing or buffing operation. A cutting operation is more likely to open them up. If the pores are sufficiently open they may not cause trouble. However, if they are deep or interconnected, they may cause sufficient trouble that the stock will have to be rejected. In such a case the pores should be apparent by close visual examination. Such deep pores cannot be washed free of solution in the rinse tanks. Consequently, the solution from a cleaner, pickle, or strike may be carried to the next bath. This causes spotty plating at the final rinse and, if sufficiently bad, may cause incomplete coverage, blistering, and loss of bond.

The sketch shows a condition that will cause trouble. The pore has a small opening at the surface. When the work is placed in a warm bath the air is expanded within the pore, pushing out the solution before it. When the work is next immersed in a cold rinse the air contracts, solution is drawn in, and an air bubble is trapped within the pore. The pore will now be very sensitive to any temperature change and the bubble will act as a thermal pump to pump solution in and out at the various warm and cold steps. Also it will pump solution out by expansion and contraction after the work is plated.



There are a number of things that can be done as an approach to this problem, such as impregnation, changes in the plating cycle or multiple hot and cold rinsing. Also there was one simple solution that has been applied.

In an application where flash tin plating was used to cover finished bronze surfaces, occasional spots due to porosity were encountered. They were not severe but sufficiently bad to cause loss of sales appeal.

The cycle consisted of:

1. Electroclean
2. Rinse
3. Alkaline tin plate
4. Rinse
5. Hot rinse

The plate was 0.02 to 0.05 mils thick and spots showed up after hot rinsing and became worse with time.

This problem was solved by addition of soluble oil to the hot rinse in the ratio of one quart of soluble oil to one cubic foot of rinse water. When the work dried after the hot rinse it now had a thick film of soluble oil on the surface. This resulted in some loss of the white color of the tin but it completely eliminated the spots. Apparently the oil collected in the pores as the work dried. Although there was some loss in color there was also another gain in that the work was not subject to staining by finger prints.

The oil could be removed by vapor degreasing but, if this was done, spots again showed on the work, in this case oil spots. Anything subsequently done to the work involving a liquid again caused spots. The work could be wiped or tumbled in sawdust, although the appearance due to the presence of a thin oil film was not objectionable in this particular case.

One answer to this problem is to reject porous work. However, if the work consists of sand castings, it is likely that porosity will be inherent in the casting process. It usually will not cause trouble, but occasionally spotty plating will result. The porosity is caused by the shrinkage of the metal during freezing in the casting process. It is not an unusual condition in low cost castings. If the porosity is small, dispersed through the metal or, if it consists of holes that can be rinsed, it will not be apparent at the plating line. Thus porosity is often present but not apparent. Also, as previously mentioned, the pores are sometimes closed by mechanical working.

In the example mentioned the porosity was not objectionable from the standpoint of use of the part. The amount of porosity was sufficiently small that the part would pass inspection standards. Also, there was no objection to the color of the work due to the presence of a thin film of oil.

Where the use of soluble oil in a hot rinse is not objectionable and, where occasional porosity is a problem, the process can be standardized. If the addition of soluble oil to the hot rinse is standard practice then there will be continuous production and no interruptions or loss of production for those times when a few pores in the metal might otherwise mean salvage, re-processing and loss of production time. This method is sufficiently simple and of low enough cost that it can be used on a permanent basis.

Science for Electroplaters

7. Formulas

By L. Serota

THE arrangement of the elements in the periodical table provides an approach to the method of writing formulas. Since chemical changes involve the transfer or sharing of valence electrons, the combining power of an element can be interpreted in terms of electrons required to attain the stable configuration (octet) of an inert gas element. The position of an element in a specific group in the periodic table is an indication of its lending or borrowing capacity (of electrons). For example, the atom of an element in Group I, with one electron in the valence shell, will readily transfer the single electron and assume the stable configuration of the inert gas preceding the element in the periodic table. This change will result in the formation of an electropositive ion carrying a charge of plus one. Its oxidation state is said to be plus one. An atom of an element in Group VII, however, with seven electrons in the valence shell, will, preferentially, gain a single electron to attain the octet configuration of the inert gas following the Group VII element in the period table. The kernel resulting from this change will carry an electronegative charge of minus one.

This principle can thus be applied to writing a formula. A sodium atom in Group I will, upon transferring its valence electron change to a sodium ion, assume a charge of plus one. The resulting stable configuration will be that of the inert element neon. This can be represented as Na^+ . By the same procedure, a chlorine atom, upon gaining an electron, will carry a charge

of minus one and the resulting stable configuration will be that of the inert element argon. This can be represented as Cl^- . It is apparent that chemical combination of sodium and chlorine involves the transfer of a single electron, so that one sodium atom will unite with one chlorine atom to form the compound sodium chloride. The formula for this compound will therefore be NaCl .

The elements in Group Ib, the traditional elements with variable valences, would form two different compounds in uniting with chlorine. Copper will carry a charge (valence) of plus one when the single valence electron is transferred, and a charge of plus two when an additional electron from the inner 18 electron shell is transferred. The symbols for the copper ions would be Cu^+ (cuprous) when one electron is transferred and Cu^{++} (cupric) when the second electron is removed. The Cu^{++} (cupric) ion with two electrons transferred will give complete configuration shells for the two chlorine atoms. The formulas would therefore be CuCl (cuprous chloride) and CuCl_2 (cupric chloride).

The same procedure employed for magnesium, which is representative of Group II elements, with two electrons in the outer orbit would show an oxidation state of plus two, Mg^{++} , and its chemical union with chlorine would result in the formation of the compound magnesium chloride, with the formula MgCl_2 . Mercury in Group IIb, with an eighteen electron inner shell, exhibits two oxidation (valence) states, a plus one mercurous ion (Hg^+ , or more properly Hg_2^{++}) and the plus two mercuric ion (Hg^{++}).

Aluminum in Group III would show a valence of plus three (Al^{+++}) and chemical combination with chlorine would give the compound aluminum chloride with the formula AlCl_3 .

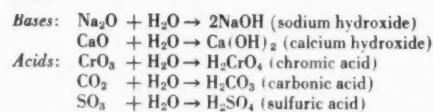
The mechanics of writing a formula are reduced to a knowledge of the number of electrons (transferred or shared) required in a chemical change. Oxidation states for reacting elements may be electropositive and electronegative. When the atom gives up one or more electrons to attain the stable configuration of the corresponding inert gas element it will carry an electropositive charge. The charge on the atom will be electronegative when one or more electrons are added to complete the octet. Compound formation can result with the same element exhibiting in some instances a positive valence

charge and, in other cases, a negative valence charge. It may be electrovalent or covalent depending upon the electron affinity of the combining elements. For example, hydrogen will combine with many of the lighter elements, so that compounds of hydrogen with elements in the second horizontal row of the periodic table can be shown. The number of valence electrons for each element are represented by dots; one for lithium in vertical row I and seven for fluorine in row VII.

Element	Li	B	C	N	O	F
Compound	LiH	H_2BeH_2	H_2CH_2	H_3CNH	H_2ONH	HOFH
Formula	LiH	BeH_2	BH_3	CH_4	NH_3	H_2O HF

This class of compounds is known as hydrides. When the hydrogen is combined with the more electropositive elements such as the metals lithium and beryllium, the electron is transferred to the hydrogen. The hydrogen will then carry a charge of minus one (H^-) and will assume the configuration of helium. The remaining elements (non-metals) indicated in the series are more electronegative and will share the electrons with hydrogen, forming covalent linkage. Because of the strong electronegativity of fluorine, it will tend to acquire, to a greater degree, the electron of the hydrogen in the compound hydrogen fluoride, HF . This greater ionic character will give the hydrogen a charge of plus one (H^+). It should be mentioned that the hydride of beryllium is not easily prepared and that the hydride of boron exists as B_2H_6 (dimer) and not as the molecule.

One additional factor to consider in writing formulas relates to the types of compound formed when water reacts with the oxides of metals and non-metals. For the oxides of metal ions with small positive charge, a class of compounds called bases will form, whereas the oxides of non-metals and metals of higher oxidation state will form a class of compounds known as acids.



It will be observed that the compounds classified as bases contain an OH (hydroxyl) group. The term *radical* is used in referring to the behavior of a group of elements in a molecule that resemble a single atom and remain as a unit in chemical changes. In the example of bases given, the hydroxyl (OH) radical acts as a non-metal, receiving the electron from

Table 1
Valence Chart for Elements and Radicals

Valence	+1	+2	+3	+4
<i>Ion</i>	H^+ Na^+ K^+ Ag^+ Cu^+ (cuprous) Au^+ (aurous) $(NH_4)^+$ (ammonium)	Ca^{++} Zn^{++} Cd^{++} Ba^{++} Cu^{++} (cupric) Sn^{++} (stannous) Ni^{++} Co^{++} Fe^{++} (ferrous) Pb^{++} (plumbous)	Al^{+++} Fe^{+++} (ferric) Cr^{+++} Rh^{+++} Au^{+++} (auric)	C^{++++} Si^{++++} Rh^{++++} Pb^{++++} (plumbic) Sn^{++++} (stannic)

Valence	-1	-2	-3	-4
<i>Ion</i>	Cl^- (chloride) $(OH)^-$ (hydroxyl) F^- (fluoride) $(NO_3)^-$ (nitrate) $(BF_4)^-$ (fluoborate) $(CN)^-$ (cyanide)	$O=$ (oxide) $(CrO_4)^-$ (chromate) $S=$ (sulfide) $(SiF_6)^-$ (fluosilicate) $(CO_3)^-$ (carbonate) $(SO_4)^-$ (sulphate)	$(PO_4)^{\equiv}$ (phosphate) $(BO_3)^{\equiv}$ (borate)	$(P_2O_7)^{==}$ (pyrophosphate)

the metal and assuming a negative charge. The hydroxyl ion (radical), representative of bases, carries a charge (valence) of minus one (OH^-).

In the same manner, acid radicals act as non-metals and receive electrons from hydrogen, thereby assuming a negative charge. The charge on the acid radical will depend upon the number of hydrogens with which it is combined. In the three examples given, each radical combines with two hydrogen atoms. The two electrons are transferred in each instance, leaving two hydrogen ions. H^+ — hydrated $H(H_2O)^+$ or H_3O^+ — a characteristic of acids, and the acid radical with a charge (valence) of minus two. The radical $(CrO_4)^-$ is called the chromate ion; $(SO_4)^-$ is called the sulfate ion; $(CO_3)^-$ is called the carbonate ion. A radical (ion) that acts as a metal, carrying a charge of plus one, is called the ammonium ion $(NH_4)^+$. A list indicating common valences of metals, non-metals and radicals (Table 1) may be used for writing formulas familiar in plating operations. Such formulas and the corresponding names of the compounds are shown in Table 2.

The names of compounds formed with metals exhibiting variable valences are differentiated by using the suffix *ous* for the name of the compound with the lower valence of the metal, and the suffix *ic* for the name of

Table 2 Formulas

<i>Acids</i>	$BaCO_3$ —barium carbonate
HNO_3 —nitric acid	$Pb(BF_4)_2$ —lead (plumbous) fluoborate
HF —hydrofluoric acid	$Cu(BF_4)_2$ —copper (cupric) fluoborate
HCl —hydrochloric acid	$PbSiF_6$ —lead (plumbous) fluosilicate
H_2CrO_4 —chromic acid	$CuSO_4$ —copper sulphate
H_2SiF_6 —fluosilicic acid	$NiSO_4$ —nickel sulphate
H_2SO_4 —sulphuric acid	$SnSO_4$ —tin (stannous) sulphate
H_2CO_3 —carbonic acid	$Rh_2(SO_4)_3$ —rhodium sulphate
H_3PO_4 —phosphoric acid	Na_3PO_4 —sodium phosphate
H_3BO_3 —boric acid	$RhPO_4$ —rhodium phosphate
<i>Bases</i>	$SnCl_2$ —tin (stannous) chloride
$NaOH$ —sodium hydroxide	$NiCl_2$ —nickel chloride
KOH —potassium hydroxide	NH_4Cl —ammonium chloride
$Ca(OH)_2$ —calcium hydroxide	$AuCl_3$ —gold (auric) chloride
$Ni(OH)_2$ —nickel hydroxide	$PbCrO_4$ —lead chromate
$Fe(OH)_3$ —iron (ferric) hydroxide	$Zn_2P_2O_7$ —zinc pyrophosphate
<i>Salts</i>	<i>Oxides</i>
$NaCN$ —sodium cyanide	CuO —copper (cupric) oxide
KCN —potassium cyanide	Ag_2O —silver oxide
$AgCN$ —silver cyanide	Au_2O_3 —gold (auric) oxide
$CuCN$ —copper (cuprous) cyanide	ZnO —zinc oxide
$AuCN$ —gold (aurous) cyanide	CdO —cadmium oxide
$Zn(CN)_2$ —zinc cyanide	Al_2O_3 —aluminum oxide
$Cd(CN)_2$ —cadmium cyanide	SnO_2 —tin (stannic) oxide
Na_2CO_3 —sodium carbonate	SiO_2 —silicon dioxide
K_2CO_3 —potassium carbonate	PbO_2 —lead (plumbic) dioxide
	Cr_2O_3 —chromic oxide

the compound with the higher valence of the metal.

$Au^+ \rightarrow AuCl$ aurous (gold) chloride
 $Au^{+++} \rightarrow AuCl_3$ auric (gold) chloride

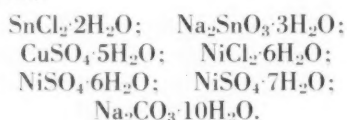
Hydrates

A large number of compounds combine chemically with water to form a class of compounds known as hy-

Table III. Determination of Formula Weight

Element	Atomic Weight	No. atoms in comp'd	Total Weight	Element	Atomic Weight	No. atoms in comp'd	Total Weight
CuCN				H₂SO₄			
Cu	63.54	× 1	= 63.54	H	1.008	× 2	= 2.016
C	12.01	× 1	= 12.01	S	32.066	× 1	= 32.066
N	14.008	× 1	= 14.008	O	16.00	× 4	= 64.00
Formula Weight = 89.558				Formula Weight = 98.082			

drates. The number of molecules of water so attached will vary with different compounds and sometimes with the same compound. These molecules of water, which can usually be driven off by heating the compound to 100° C. or higher, are known as water of hydration or water of crystallization. Some examples of hydrates are as follows:



Formula Weight

Formula weight refers to the sum of the weights of the atoms representing the simplest formula of the compound. This formula is known as the *empirical formula*, as distinguished from the formula representing the molecular weight of a compound. The molecular weight of a compound cannot be determined unless the substance can be vaporized or a study made of its properties in solution. Acetylene, a gas, is represented by the formula C₂H₂ and benzene, a liquid, is represented by the formula C₆H₆. The formulas represent the ratio of carbon and hydrogen atoms for the respective compounds in the vapor state. The empirical or simplest formula for either compound would be CH. The formula weight, therefore, for the empirical formula CH would not distinguish between the molecular weights represented by their respective formulas C₂H₂ and C₆H₆.

Formula weights can be determined by referring to the atomic weights of the elements in atomic weight tables. The formula weights for copper cyanide, CuCN, and sulfuric acid, H₂SO₄, may be obtained by the method indicated in table 3.

Determination of Formula Weight

For most of the calculations required in daily plating operations, whole numbers or figures worked out to the nearest first decimal place are sufficiently accurate.

The weight of copper in the com-

pound copper cyanide, CuCN, may be represented fractionally.

$$\frac{\text{Cu}}{\text{CuCN}} = \frac{63.54}{89.558} = 0.7095$$

Since the formula for this compound does not change and, since the weights of the elements are constant, the value 0.7095 represents the ratio of copper in the compound copper cyanide. The value, accordingly, remains constant and is called a factor. By using this factor the weight of copper in any quantity of copper cyanide can be determined. For example,

1 pound copper cyanide contains
(1 × 0.7095) = 0.7095 lb. Cu.

5 pounds copper cyanide contain
(5 × 0.7095) = 3.5 lbs. Cu

100 pounds copper cyanide contain
(100 × 0.7095) = 70.95 lbs. Cu

The weight of metal (or element) in a compound may also be expressed as per cent of metal (or element) in the compound.

$$\frac{(\text{CuCN}) = 89.558}{(\text{Cu}) = 63.4} \times 100 = 70.95\%$$

Hence:

$$\begin{array}{l} 1 \text{ lb. CuCN contains} \\ 70.95 \\ (1 \times \frac{70.95}{100}) = 0.7095 \text{ lb. Cu} \end{array}$$

$$\begin{array}{l} 5 \text{ lbs. CuCN contain} \\ 70.95 \\ (5 \times \frac{70.95}{100}) = 3.51 \text{ lb. Cu} \end{array}$$

The value obtained for a factor, it will be observed, when multiplied by 100 will give the value in per cent (by weight) of the element in the compound. The application of this calculation to tank control can be demonstrated by checking the values of a compound in a typical plating tank composition. A low cyanide bath shows the following values for copper cyanide.

	oz./gal.	g./l.
Cuprous cyanide	3	22.5
(Total Copper)	2.1	16

To check the value of metallic copper, in oz./gal. and g./l. represented in the formula, the methods introduced will be employed.

Method (a):

$$\begin{array}{l} \text{Copper factor in CuCN} = 0.7095 \\ 3 \times 0.7095 = 2.1 \text{ oz./gal. Copper} \\ 22.5 \times 0.7095 = 16 \text{ g./l. Copper} \end{array}$$

Method (b):

$$\begin{array}{l} \text{Per cent copper in CuCN} = 70.95\% \\ 100 \\ 3 \times \frac{100}{70.95} = 2.1 \text{ oz./gal. Copper} \\ 100 \\ 22.5 \times \frac{100}{70.95} = 16 \text{ g./l. Copper} \end{array}$$

The complete mathematical expression would be

$$\begin{array}{l} (\text{Cu}) = 63.54 \\ \frac{\text{Cu}}{\text{CuCN}} = \frac{63.54}{89.558} \times 3 \\ (\text{CuCN}) = 89.558 \\ = 2.1 \text{ oz./gal. Copper} \\ (\text{Cu}) = 63.54 \\ \frac{\text{Cu}}{\text{CuCN}} = \frac{63.54}{89.558} \times 22.5 \\ (\text{CuCN}) = 89.558 \\ = 16 \text{ g./l. Copper} \end{array}$$

A table in the 1955 edition of the METAL FINISHING GUIDEBOOK lists the percentage of metal in common plating salts. Some of the values are:

Technical Name	Chemical Formula	% Metal
Copper fluoborate	Cu(BF ₄) ₂	26.8
Copper sulfate (ic), crystal	CuSO ₄ ·5H ₂ O	25.5
Chromic Acid	CrO ₃	52.0
Silver cyanide	AgCN	80.5
Nickel chloride, crystal	NiCl ₂ ·6H ₂ O	24.7

The same procedure may be employed to determine the composition of a plating solution. If an analytical report for this same copper cyanide tank solution for which calculations were shown indicates, let us assume, the presence of 2.1 oz./gal. of copper, how many ounces per gallon of copper cyanide does the tank contain?

Factor:

$$\begin{array}{l} \text{Cu} \\ \frac{\text{Cu}}{\text{CuCN}} \times 2.1 = \text{oz./gal.} \\ \text{copper cyanide} \end{array}$$

Substituting:

$$\begin{array}{l} 89.558 \\ \frac{63.54}{89.558} \times 2.1 = 3.0 \text{ oz./gal.} \\ \text{copper cyanide} \end{array}$$

SHOP PROBLEMS

ABRASIVE METHODS SURFACE TREATMENTS CONTROL
ELECTROPLATING CLEANING PICKLING TESTING



METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Ormolu Metal

Question: Recently I read in "Shop Problems" a recommended procedure for producing an "Ormolu" finish gold plate. I recollect that much of the good quality ware produced in the old days used real Ormolu metal rather than a deposit. I would appreciate information as to the composition of this metal.

L. M.

Answer: Ormolu metal is a gold-colored copper alloy consisting of approximately 583 parts copper, 167 parts tin and 253 parts zinc. A higher copper content results in a color which we would call "Roman Gold."

Removing Magnaflux Dye

Question: We are having a difficult time removing the dye or Magnaflux from the enclosed cadmium plated screws. We can remove same in acetone but, due to the danger of its use, we are looking for another method. Have you any other method which is cheaper and easier to do the job?

T. C.

Answer: The dye can be removed by a 15 minute soak in carbon tetrachloride. If you have a solvent degreaser, the stripping action of hot trichlorethylene may be more rapid, and more economical because the used solvent can be recovered.

Stripping Gold from Silver

Question: Can you give us a good solution for stripping gold from silver? Our base metal is brass, silver plated and then gold plated.

K. M.

Answer: Gold can be removed from

silver with reverse current in a 10% solution of muriatic acid, operated at about 120 deg. F. The voltage should be kept low to avoid pitting of the brass base, should the silver deposit be defective on any part of the surface.

Plating Over Nickel

Question: We bright nickel and chromium plate our casserole serving frames that are manufactured of No. 3 finish steel. From time to time we have rejects.

We installed a copper plating tank to use prior to nickel and chrome plating our rejects after removing chrome in the reverse cleaner tank. We go through our regular cleaning cycle but it keeps blistering at the copper flash tank. We cannot use muriatic acid because its fumes attack our No. 3 finish steel parts. How can we overcome this blistering?

M. M. F.

Answer: In order to plate on nickel without blistering it is necessary to use a nickel strike. The solution contains the following:

Muriatic acid — 1 pint/gal.

Nickel chloride 2 lbs./gal.

The strike is used at room temperature and 6 volts, direct current for about 1/2—1 minute with nickel or carbon anodes.

Nickel and chromium can be stripped with reverse current in a solution of sulfuric acid at 50-55 deg. Baume. This is equivalent to about 3 gallons of acid to 2 gallons of water.

Anodizing Aluminum

Question: I enjoy reading METAL FINISHING each month and would ap-

preciate receiving an answer to a problem we are encountering in anodizing aluminum, using the chromic acid process.

Periodically, parts are "eaten" during the anodizing cycle. An excellent example was with small motion projector pulleys manufactured from 52 S bar stock. A large group of the pulleys were racked using 2SO aluminum wire. When the pulleys were taken from the bath approximately one-third were attacked. The attack varied from small areas on individual pulleys which were stained a golden color to some of the pulleys being partially consumed. We would appreciate information on the cause and remedy of the above problem. Incidentally, who usually pays for the ruined parts; the shop which accepted the work or the manufacturer who submitted the parts for anodizing?

J. L. W.

Answer: Assuming voltage and temperature are correct, corrosion of aluminum in the chromic acid anodizing solution might be due to chlorides in the solution or to segregation of the magnesium or chromium in the aluminum alloy. A job plater would be responsible for the former and the manufacturer for the latter but this, of course, would be subject to the conditions of acceptance of the contract.

Chromic Anodizing Specifications

Question: Please send us information on the chromic acid anodizing of aluminum and aluminum alloys, composition of solution and government finishing specifications. At present we are using chromic acid anodizing from the METAL FINISHING GUIDEBOOK.

Composition of solution: chromic acid 8% or 10.7 oz./gal., sulfuric acid .0670 oz./gal., sodium chloride .0268 oz./gal. We do not have any trouble with this formula, and are doing the job well but we want to com-

ply with the government finishing specifications.

At what percentage is the sulfuric acid and the sodium chloride? We would appreciate it very much if you would forward this information to us.
Y. K.

Answer: The section on anodizing in the 1955 edition of the METAL FINISHING GUIDEBOOK, page 428, covers both industrial and government requirements. Specifications call for not more than 0.2 g./l. sodium chloride and 0.5 g. l. sulfuric acid in the solution, which is exactly equivalent to your present composition. The chromic acid content should be 5-10% (6.7-13.4 oz./gal.).

On page 487 of the above book you will find a list of applicable government specifications which you can obtain from the Air Force.

Dull Nickel Finish

Question: We are endeavoring to obtain a dull white matte nickel finish. We are presently employing a conventional "Watts" type nickel solution with no additions for brightening. The resultant finish is somewhat of a semi-bright nature. This is unsatisfactory for our purpose, and if there is some method of dulling the brass parts prior to plating, or an addition of another constituent that may give us a dull matte finish, we would appreciate your advising us or making recommendations accordingly.

V. F. S.

Answer: A semi-bright deposit from a Watts type nickel solution is an indication of contamination. The solution should be carbon treated and electrolyzed to obtain a dull white color. The brass can be dulled by abrasive blasting or by etching in a solution of equal volumes of 40 deg. ferric chloride and muriatic acid, followed by a quick dip in a dichromate type bright dip to clean up the surface.

Bright Copper and Brass

Question: Please send me any information that you have on very bright brass and copper plating. There appears to be something new which is brighter than the brass which we have been doing in the past.

A. U.

Answer: There are a number of high-speed, bright copper plating solutions on the market. These are described on pages 254-5 of the 1955

edition of the METAL FINISHING GUIDEBOOK, and a list of suppliers will be found on page 546.

The very bright brass finish which has been appearing on the market recently is a flash plate of about 1/2-2

minutes applied over bright nickel. This process eliminates the necessity for applying a heavy brass deposit and buffing. A standard brass plating solution is employed, to which arsenic brightener is often added.

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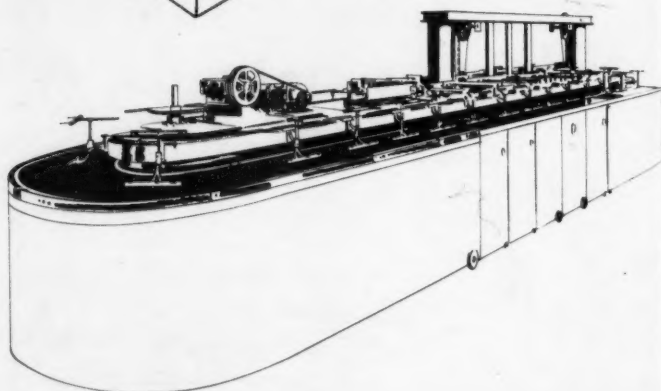
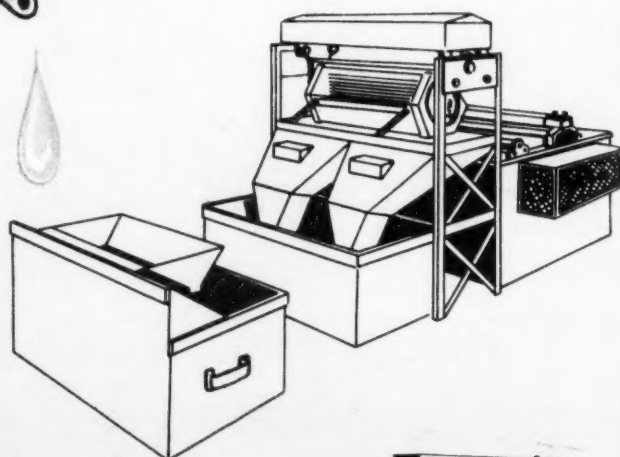
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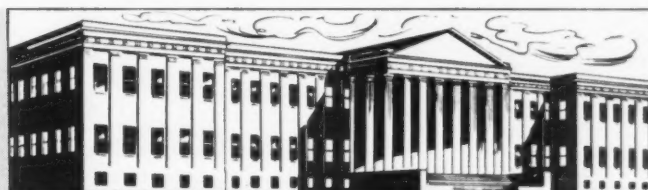
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SEE THE OTHER SIDE OF THIS INSERT

Patents

RECENTLY GRANTED PATENTS
IN THE METAL FINISHING FIELD



Buffing Wheel

*U. S. Patent 2,699,632. Jan. 18, 1955.
G. A. Lyon.*

As an article of manufacture, a surface-treating wheel comprising a cup shaped supporting member including a peripheral flange like wall about a backing having a surface inside the wall of irregular shape conforming generally to that of the contour of an object to be treated, a continuous strip of treating material of uniform width coiled edgewise on said surface from the center outwardly toward said peripheral wall and secured in coil form on said surface so that the outer operative face of the strip conforms generally to the shape of said surface, said peripheral wall having an inwardly projecting annular flange for overlapping an outer turn of the coil strip to assist in holding the coiled strip on said surface.

Abrasive Wheel

*U. S. Patent 2,700,257. Jan. 25, 1955.
M. E. Landau.*

In a finishing wheel employing an annular supporting frame adapted for mounting on a power driven shaft for rotation therewith, a conforming rim assembly comprising equal elongated arcuate weight members with the ends thereof in abutting relation to form a ring circumferentially arranged on said frame, said rim having not more than three arcuate rim members for wheels up to twelve inches in diameter and not more than six such rim members in the rim for wheels of larger diameters, the purpose of so dividing the rim being to permit the rim to expand and contract during rotation of the wheel and by so minimizing the number of divisions in the rim to retain sufficient mass in each rim member to utilize the resulting concentration of weight therein for enhancing the force thereof from centrifugal action during rotation to properly support an abrasive band carried on said

rim, connector pins having their ends loosely fitted in openings in the confronting ends of adjacent rim members and being adapted to adjust freely in said openings as the rim members move outward and inward during rotation for aligning and uniting the rim members in their movement to thereby control and consolidate the members to act as a unitary rim to derive the cumulative effect of the total weight and force under centrifugal action during rotation.

Gas Plating

*U. S. Patent 2,700,365. Jan. 25, 1955.
P. Pawlyk, assignor to The Commonwealth Engineering Co. of Ohio.*

Apparatus for the metallic plating of heat conductive objects by pyrolysis of metal-bearing gaseous compounds, comprising an envelope of heat insulating material having means therein to support an object to be plated, a gas carrying member of heat insulating material mounted internally of said envelope in spaced relation with said support means, said member having apertures therein facing towards said support means, means to maintain the envelope cool, and means positioned outside of said envelope for inductively heating a heat conductive workpiece when mounted on said support means.

Solvent Degreaser

*U. S. Patent 2,700,645. Jan. 25, 1955.
T. J. Kearney, assignor to Detrex Corp.*

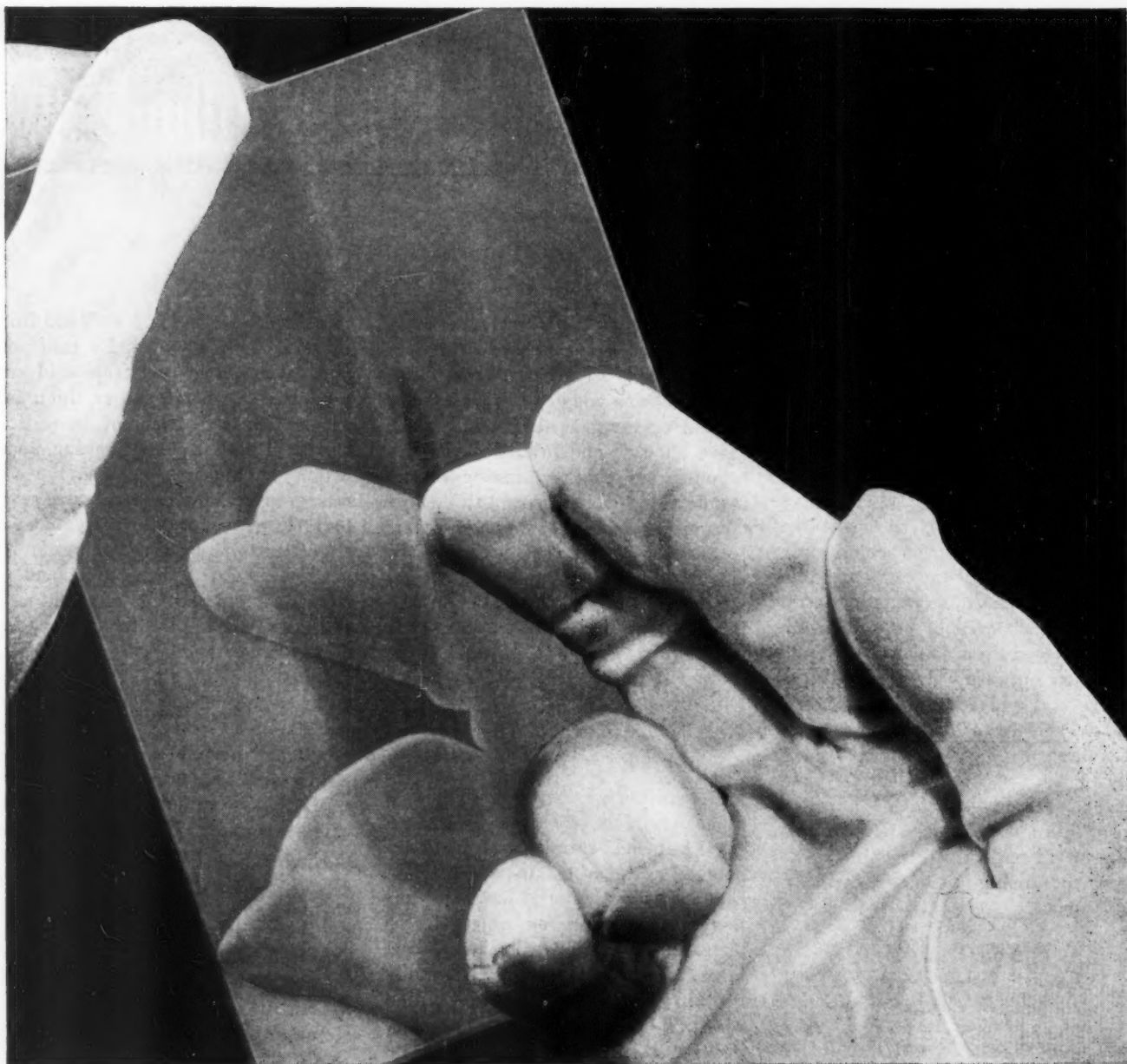
In a degreasing apparatus for use in treating with solvents such as trichloroethylene, a horizontally elongate quadrangular housing having continuous, straight, interiorly-unobstructed side walls, end walls and bottom; a transverse vertical partition extending part way up within the housing from the bottom adjacent one end of the housing; a tray-like horizontal partition extending between the top of the verti-

cal partition to said end wall and from side wall to side wall and a roof portion extending inward from said end wall above the horizontal partition and terminating in the plane of the vertical partition, with resultant setting apart within the housing, an open top solvent evaporation tank into which work to be cleaned is introduced from above, a smaller solvent storage reservoir beneath the horizontal partition, and an offset above the horizontal partition in full communication with the evaporation chamber and positioned substantially below the top of the evaporation tank; a solvent overflow outlet from the storage reservoir to the evaporation tank; heating means for boiling the solvent in the tank; a packet through which coolant is passed extending perimetricaly about the housing medially of the height of the offset aforesaid for maintaining a top limit level for the vapor released from the hot solvent in the tank; a horizontally arranged helical condenser coil extending crosswise of the housing from side to side in the offset aforesaid at an elevation corresponding to that of the jacket through which coolant is circulated; and means for conducting the condensate released from the condenser coil and collected by the tray-like horizontal partition for return to the storage reservoir.

Hot Galvanizing

*U. S. Patent 2,701,194. Feb. 1, 1955.
H. C. Deterding.*

The method of recovering zinc metal and zinc base alloy from a zinc dross containing zinc metal, zinc base alloys and oxides of metals present in said zinc base alloys, which comprises agitating said dross in a molten state at a temperature of around 900°F. with an admixture of a flux composition consisting essentially of a mixture of from 40 to 55% of calcium chloride, from 25 to 45% of barium chloride, a sufficient amount of sodium chloride



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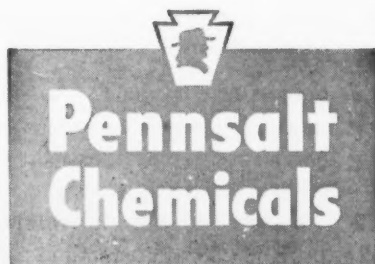
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to make a total of 100%, and a sufficient amount of an alkaline earth metal fluoride selected from the group consisting of calcium, strontium and barium fluorides to be stoichiometrically equivalent to between 1 and 5% calcium fluoride by weight of said mixtures, continuing such agitation until a substantial separation of molten zinc metal and zinc base alloys from the metallic oxides has been effected, with the metallic oxides held in suspension in said flux on top of said molten zinc metal and zinc base alloys, and skimming off said flux-metallic oxide suspension to recover zinc and zinc base alloys substantially free from metallic oxides.

Abrasive Pad

U. S. Patent 2,700,852. Feb. 1, 1955.
A. Field.

An abrading implement, comprising a first strip of abrasive coated flexible material folded upon itself to form a plurality of plies, a second strip of like material in enfolding relation to the first said strip and having on its one end a tongue received between the plies of said first strip, and means for holding said strips in assembled, folded condition to define a pad.

Vitreous Enameling

U. S. Patent 2,701,214. Feb. 1, 1955.
C. Velonis and W. Karp, assignors to Graphire Corp.

A method of forming on a vitreous surface a precious metal character raised substantially above the plane of the vitreous surface to give the appearance of a glossy solid precious metal character attached to said surface consisting of printing the character through a screen onto the surface with a paste comprising a ceramic flux having a volatile binder, firing the flux at a temperature equal to the maturation point of the flux but below the softening point of the vitreous surface thus forming a smoothed surfaced character raised substantially above the plane of the vitreous surface, coating the raised characters so formed by printing over the raised portions thereof with a screen having identical printing areas as the first screen and with said areas in exact register with said raised character with a precious metal composition in colloidal suspension in a heat dispersible binder and firing the metal composition at a temperature be-

low the maturation point of the flux, but of sufficient heat to cause maturation and adhesion of the applied precious metal compound to the previously formed raised character to produce an article having glossy smooth raised characters of coated metal extending above the plane of said surface.

Bright Copper Bath

U. S. Patent 2,701,234. Feb. 1, 1955.
C. J. Wernlund, assignor to E. I. du Pont de Nemours & Co.

The process for electroplating copper which comprises electrodepositing copper from a copper cyanide plating solution which is substantially free from thiocyanate and selenocyanide ions and which contains a selenium compound selected from the group consisting of the water soluble selenates and selenites, in concentration equivalent to 0.005 to 0.5 grams per liter of elemental selenium and 0.025 to 50 grams per liter of an alkali metal salt of methylene-bis (*a*-naphthalene sulfonic acid), while periodically reversing the electroplating current in such manner that in each cycle of current alternation the cathodic current time is not less than about 15 seconds nor more than about 150 seconds and the anodic current time and current density is such that the cathodic current exceeds the anodic current by at least 10% and the anodic current time is at least 2 seconds, with solution agitation equivalent to a flow of electrolyte across the cathode surface at a velocity of about 10 to 1,000 feet per minute.

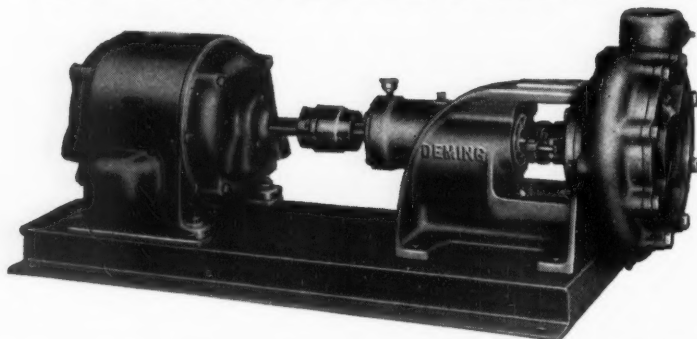
Chromium Bath

U. S. Patent 2,704,273. Mar. 15, 1955.
T. Yoshida.

A process for the electrodeposition of metallic chromium which comprises causing electrodeposition of metallic chromium from an electrolytic bath consisting of an aqueous solution containing per liter 41 to 73 grams trivalent chromium, 180 to 264 grams free urea, 90 to 123 grams of a substance selected from the group consisting of ammonium, ammonium and potassium, ammonium and sodium, and ammonium, potassium and sodium, the amount of potassium and sodium, when included, not exceeding 55 grams, and sulphate radical in an amount at least stoichiometrically equivalent to the amount of ammon-



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ium radical, potassium and sodium when included, and trivalent chromium, said solution having been aged at a constant electrolytic temperature to cause an equilibrium in the state of the complex ions in the solution at the temperature of electrolysis, said temperature being between 25° and 55°C., with an anode consisting of 4 to 12% tin, 1 to 10% silver, 0.1 to 2.5% cobalt and the balance lead.

Gas Plating

U. S. Patent 2,704,727, Mar. 22, 1955. P. Pawlyk, assignor to The Commonwealth Engineering Co. of Ohio.

The method of gas plating on an object which method comprises: heating an object to a decomposition temperature for metal bearing vapors in a plating zone, heating a thermally decomposable metal-bearing compound in a substantially enclosed spacing to a temperature sufficient to produce vapors of the compound and insufficient to effect decomposition of the compound, separately heating a carrier gas to a temperature which is substantially that of the compound and its vapors and then flowing the heated carrier gas into contact with said heated metal-bearing compound and vapors in the spacing to produce a heated mixture of carrier-gas borne metal bearing vapors, and flowing the resultant mixture of gases to the plating zone into contact with the heated object to be plated.

Corrosion Preventive

U. S. Patent 2,704,264, Mar. 15, 1955. J. M. Michel and K. F. Hager, assignors to the United States of America.

The process of protecting a metal surface against corrosion which comprises applying to said surface a solution comprising a major proportion of a liquid hydrocarbon and a minor proportion of octadecyl sulfamido acetic acid sodium salt.

Hot Galvanizing

U. S. Patent 2,703,766, Mar. 8, 1955. O. B. Ellis and K. Oganowski, assignors to Armco Steel Corp.

A process of continuously galvanizing ferrous strip which comprises passing the cleaned ferrous strip through a zinc bath containing substantially .12% to .30% of lead and substantially .04% to .35% of aluminum, the

immersion time in the said bath being less than about 6 seconds, the strip speed being greater than about 80 feet per minute.

Anodizing Aluminum

U. S. Patent 2,703,781, Mar. 8, 1955.
F. H. Hesch, assignor to Kaiser Aluminum & Chemical Corp.

A process for the formation of a clear non-iridescent protective oxide coating on aluminum and aluminum base alloys comprising anodically coating the metal surface in an electrolyte consisting essentially of from about 15 to about 40% by weight phosphoric acid and from about 2 to about 10% by weight sulfuric acid, balance substantially water.

ABSTRACTS

The following papers were read at a meeting, held October 1954, of the *Forschungsgesellschaft Blechverarbeitung* (German Sheet Research Institute) in conjunction with the *Forschungsinstitut fuer Edelmetalle* (Research Institute for Noble Metals).

Practical Considerations of Immersion Buffing and Polishing Techniques

By Dr. Ing. Wellner

The author first described the construction of the immersion buffing and polishing machine which has been brought to the stage of commercial application by prolonged development work on the part of the German Wuerth. Metallwarenfabrik Geislingen and is now marketed by the German firm Hahn und Kolb, Stuttgart. The machine consists of a large buffing or polishing drum which has a diameter of about 10 feet with a height of about 2 ft. The objects which are to be buffed or polished are held on arms, either magnetically or by vacuum, at four loading stations and these arms can be dipped into the processing drum. The drum is rotated at 130 r.p.m. Drive is by a 50 kw. motor through a reduction gear. The rotating drum is charged with a buffing or polishing compound; for buffing purposes in general it consists of a mixture of electro-corundum with



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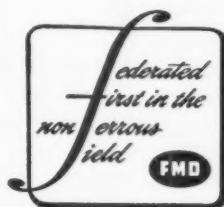
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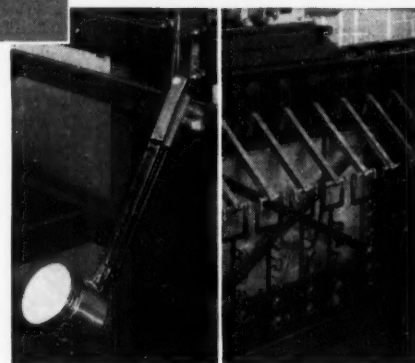
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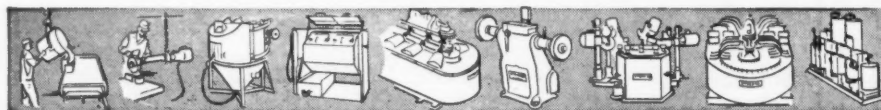


A single part can be placed on each carrier arm as shown in the illustration above or racks of numerous parts can be used.



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by D. J. Swaninger

Sales Manager—Stevens Compositions

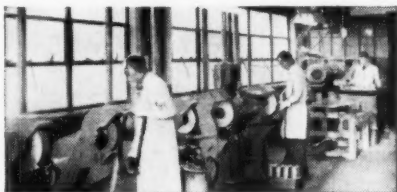
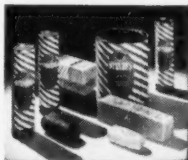


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For special size machine cake applications on any non-ferrous metal Stevens 44 Tripoli is our latest offering. It has a strong texture and a medium-high melting point. It has more cut, along



with excellent coloring. Better still, the price is right. Repeat orders from big customers tell the story.

For final coloring of brass we recently introduced new Stevens 482 white rouge. It gives equal coloring results of red rouge but, of course, has the advantage of eliminating the discoloration of shop and clothing.

With new model products of every kind high in use of decorative trim and hardware—with the increasing use of zinc and aluminum die castings as well as stainless steel—manufacturers are searching for new, better and faster finishing compositions. If you have a finishing problem why not let us make recommendations after an L.V.* Report. No obligation, of course. Write today for further details.

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pumice and oil. Other mixtures can also be used.

By virtue of the centrifugal force, the buffing mixture is impelled to the outside edge of the drum. The four arms dip into this and the buffing compound impinges with considerable velocity on the surface of the parts. In addition, because of the centrifugal acceleration, the buffing medium is brought into a relatively densely packed condition. Both of these effects result in an astonishingly low buffing time. As an example, it was stated that for scissor and shear blades, the coarse buffing time is 40 seconds and, for the cross pieces of bicycle front forks, 30 seconds.

An important problem as regards the commercial feasibility of the process is the erosion of the arms. It is clear that with the process, it is not possible to work out pores and coarse surface defects; casting seams must also be first removed mechanically. The advantages of the immersion buffing and grinding process are:

1. An enormously rapid finishing speed;
2. Only unskilled labor is necessary to operate the machine;
3. The consumption of buffing or grinding medium is very low. The mixture can be regenerated for new use;
4. Manifold application possibilities, particularly for parts which need to be buffed on one side.
5. Polishing processes can also be conducted on the same machine.

In order to obtain a surface finish which is as uniform as possible, the objects are revolved if necessary during the buffing process. The in and out traversing of the ware holding arms, which is affected hydraulically, requires about 5 seconds. Particularly suitable for treating in the machine are parts such as hub caps, flat-iron covers, reflectors, etc.

The power absorbed in driving the machine, amounting to 50 kw., represents a considerable development of heat. By cooling, the temperature is maintained within permissible limits. The question was raised that, with some samples, an "orange-peel" effect had been obtained. The author replied that, speaking generally, this was not the case with the operation of the machine. Up to now, five installations of these machines have been made and are working to the complete satisfaction of the users.

Belt Polishing Techniques

By Obering Schleppe

The contact wheel method should not be considered as a universal buffing method, for the applicability of this method is not possible in every case. It is much more correct practice if, in a modern buffing and polishing shop, all present day processes are installed. It is accordingly necessary to ascertain from practical experience the cases in which the adoption of contact wheel methods can be of advantage. Some guidance in this direction can be given as follows:

1. The belt polishing procedure is much simpler than that of wheel buffing. Thus, unskilled labor can be employed to a considerable extent.
2. Increased output from the buffing operator should be possible.
3. Saving in working stages are often capable of achievement.
4. The polishing times with non-ferrous metals can be shortened if the operation is performed with a belt instead of on the wheel.

The process is very suitable for non-profiled parts and also for parts drawn from thin sheet where the surface qualities may still be designated as good.

Careful consideration needs to be given to the belts as these contribute greatly to the results obtained with the process. Naturally the choice of the contact wheel is of great importance. The best results are obtained with hard contact wheels. The actual choice of contact wheel must conform to the actual part being treated. If very soft contact wheels are chosen then, naturally, no sharpening effect of the emery can be expected. The grain, in addition, will press too deeply into a soft contact wheel.

To some extent, success with this process will depend on the quality characteristics of the metal part. The example is quoted of auto bumper bars which are buffed as standard practice in the U.S.A. on an endless belt. The negative results which have been obtained in Europe with the application of this method to auto bumper bars can be ascribed to the poor qualities of the rolled sheet used. The American sheet has considerably better surface qualities. In addition, with U. S. practice, final finish specifications are not so rigid as in Europe. It is usual to apply thicker plated coatings in the

LOOK

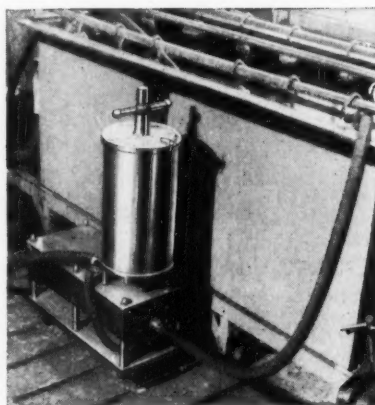


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U. S. and this, in conjunction with periodic reverse, gives a smoothing down in the plating bath. These factors all add up.

Study of the buffing process by the electron microscope is instructive. The buffing scratches, perfectly visible at 3,000 magnification, partly overlies one another and criss-cross. The plastic deformation of the metal can clearly be seen. With the examination of crank-shaft journals, the crumbling of the metal under the effect of the buffing action is also visible.

Buffing and Polishing Materials

By Dr. Ing. Burkart

The author defines polishing as a machining operation by which mate-

rial is removed from the surface. Buffing is a process which removes no more material. In this last case, the surface is smoothed down by the combined effect of pressure of the abrasive and the local temperature rise, causing a plastic deformation of the metal. The individual crystals in the surface layers of the metal are disintegrated during the buffing process and a smooth surface layer is formed.

As strongly acting hard polishing materials there are listed quartz (finely ground sand; pumice; natural emery (90-95% Al_2O_3); iron oxide; synthetic emery; silicon carbide (extremely hard).

As buffing media, there are available chalk (this is no longer in very

great favor but is used for certain purposes by the polishing compound manufacturers); Vienna lime (as calcined calcium oxide this is sensitive to atmospheric carbon dioxide. Compounds prepared from Vienna chalk, however, give a beautiful brilliance free from streaks on nickel plate and are still extensively used in many factories). The buffing alumina grades are perfectly stable in storage and, for a number of years, have been used to an increasing extent. Not all the types of alumina are suitable for polishing compounds. Experience is necessary to correctly choose the right grade.

An intermediate position between buffing and polishing action is occupied by Tripoli which embodies the silica skeletons of infusorial animal life. With good Tripoli compositions, brass can be brought to a high finish in one operation.

All these buffing and polishing agents are applied for use with greases, etc. Suitable binders are stearin, paraffin, oils, ceresine, emulsion waxes, normal waxes, high brilliancy waxes, etc. In recent times, application has also been made of the silicones and, particularly, of methyl silicone oils. The author found that the addition of silicone oils to the polishing composition was to give a more rapid effect. By virtue of this, the part being buffed remains cooler and the surface is not so strongly stressed. In addition, the tests which were conducted by the author with the incorporation of silicones in the buffing compound showed that those with a silicone addition can be removed with extraordinary ease with organic solvents.

Care must be taken to select the composition which is correct for the metal. A decisive factor is the correct grain size with which the desired buffing and polishing effect can be achieved. However, even the best compositions are useless if the polishing operation is not done correctly and with skill. With very rough surfaces, it is absolutely necessary that the polishing should be conducted in several working stages. Poor buffing results may not be due to any shortcomings of the buffing compound itself but is to be ascribed to the poor, previous polishing treatment. The complaint is usually that the surface of the metal after buffing is still covered with a

skin of grease. By microscopic examination, however, it can be seen that a satisfactory high brilliance is present on the surface of the metal but that the metal has not been correctly polished, so that there is a breaking-up of the impinging light which looks similar to a grease skin.

When polishing aluminum alloys, what are termed "wheel marks" are observed. The cause of this is that pores, which are almost always present in the metal, are opened by the polishing grain. During the buffing stage these pores are not noticed so that much work has been performed before this defect assumes visible appearance. Alleviation of this trouble is not possible with certainty but the part being buffed should be turned as much as possible. Treatment with a Tripoli composition is also to be recommended.

Barrel De-Burring Processes

By Dp. Ing. Heger

The author gives data concerning practical experience with the barrel process. This process is an improvement on the old process by which mass produced articles were given a high polish by being treated in the drum together with balls of a corresponding size and number, in a surface reactive solution. It comprises a combined mechanical-chemical treatment method. With this process it is possible to de-burr, round edges, remove surface unevenness and, in addition, it is also possible to smooth and polish as well as clean and descale parts. Cold and hot-formed parts of steel, copper, bronze, aluminum and all alloys can be treated.

The rotating container is an octagonal drum lined with rubber. The ware is loaded into this and the chips are added; these are specially shaped grinding and polishing bodies. The compounds are then added; in addition to a buffering action these also possess an outstanding cleaning action. The most varied surface effects can be achieved with these compounds and the uniformity of the surface produced may be regarded as one of the most important advantages of the process. In spite of the good smoothing effect achieved, a relatively little material is removed. Accordingly, it is also possible to treat precision parts such as pinion wheels, screwed and threaded parts, chain wheels, crown wheels. The right amount of chips is

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of importance to the process and this amounts to a multiple of the weight of the parts to be polished. The drum is allowed to rotate slowly (less than 30 r.p.m.), resulting in a slow movement of the ware and the chips inside the drum. A severe knocking together, as is the case with former drum polishing processes, is not to be feared here. The surface is not strongly stressed so that considerably complicated shaped parts can be handled.

Obviously the polishing effect achieved with this process will not be as good as that obtained by a manual process. With mass produced ware it suffices, however, in practically all cases, and the surface quality is sufficiently good so that, with subsequent

plating, a beautiful brilliance can be achieved. For deeply profiled ware; for example, drilled and recessed parts and hollowware, chips of varying sizes are used and, as a result, all surfaces can be treated. It is stated that, with this process, cost savings of up to 80% can be achieved.

It was further stated that a number of drum finishing processes are available and the question was raised as to whether the process, in practice, is not somewhat complicated, seeing that a considerable amount of chips of various sizes and a multiple of chemical solutions must be on hand. It was stated that one can operate with 3 to 4 kinds of chips in general to cover all practical requirements perfectly.

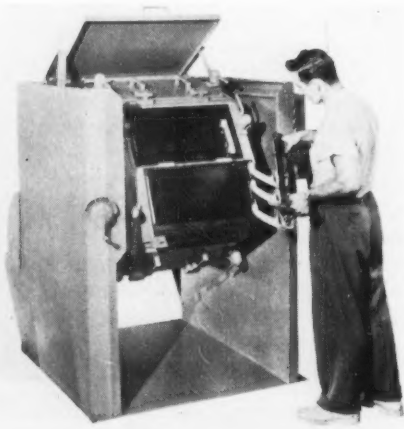
Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT
FOR THE METAL FINISHING INDUSTRIES



8-Door Tumbling Barrel

Roto-Finish Co., Dept. MF, Kalamazoo, Mich.



A new eight-door stationary fixture finishing machine designed primarily for coloring of aluminum castings has been announced by the above manufacturer. The new machine has a door on each flat of a single compartment cylinder. Fixture pads are attached to the octagon side walls of the compartment just inside the door opening.

Fixtures are in the form of grids, which fit attached pads. After the fixture is placed inside the cylinder, it is held in position during the processing operation by the pads and by pressure of the closed door pushing it firmly into the contoured pad. Fixtured parts are held by the fixture grids to effectively expose them to processing media.

It is claimed that one of the outstanding features of the machine is that it is not necessary to remove processing media or solution when removing work load from the compartment. Processing compartments vary in size up to 48 inches long and 42 inches in diameter. The latter size, used for coloring aluminum castings with steel balls, uses a $7\frac{1}{2}$ h.p. drive equipped with automatic reversing electric controls. Doors are hinged for rapid servicing of fixtured parts.

Addition Agents for Zinc Plating

Federated Metals Division, American Smelting and Refining Co., Dept. MF, 120 Broadway, New York 5, N. Y.

A series of addition agents for cyanide zinc plating, tailor-made to suit the particular needs of individual operators, has just been introduced.

Marketed as the Zimax Series, these addition agents are claimed to produce clear, bright deposits directly from the bath and increase the covering and throwing power of zinc baths. Containing no metallic components, they are more economical than previously available materials. The brighteners are stated to offer an ideal base for post-plate conversion coatings.

One member of the series is BZ-20 powder barrel zinc brightener, a low cost material giving a clear, bright white deposit, with high staying power, and very uniform deposits in produc-

tion. A stock solution may be prepared by mixing BZ-20 powder with cold water, then adding warm water.

BZ-33 liquid barrel zinc brightener is a low-cost concentrated brightener which produces blue-white deposits of maximum brilliance. High throwing power and covering power are incorporated in this material.

Included in the newly announced series is BZ special liquid barrel zinc brightener, formulated for installations requiring any of the following: moderate price; deep, clear luster of deposit; good staying power; elimination of the discoloration difficulties sometimes encountered with hot forced air drying; and elimination of an oily condition on bath surfaces sometimes resulting from other brighteners. It may be used in still zinc plating in some installations in which there is agitation, either by a moving cathode bar, or in an automatic or semi-automatic unit.

Tubular Filters

Industrial Filter and Pump Co., Dept. MF, 5904 Ogden Ave., Chicago 50, Ill.

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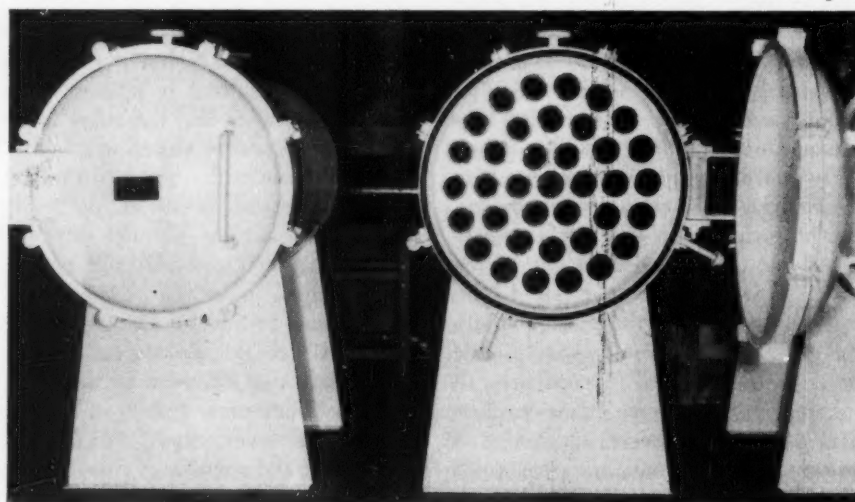
Ideal for intermittent or continuous operation.

Solids can be recovered in dry form.

Chamber can be emptied without losing cake.

No unfiltered "heel."

Can be used with or without pre-

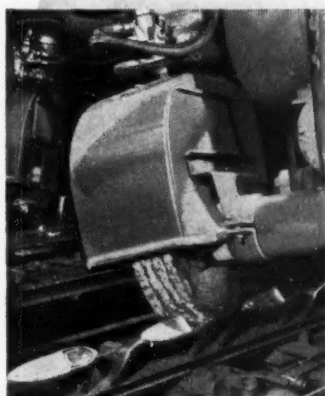


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for all metal finishing

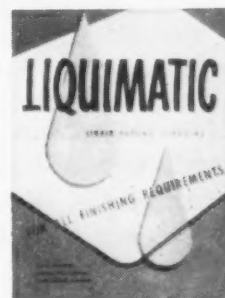


How much of the compound in your buffing room is wasted... in the nubbin pile, or in "over-heading" buffs? There's a way to "meter" the compound you use—the Liquimatic way. An electrically timed system in the Liquimatic Process feeds the exact amount of liquid compound for the exact cut you need. While compound is being saved, buffs are being saved too... continual lubrication extends buff life up to 400%.

These two cost-saving advantages

alone soon pay for a complete Liquimatic Application System. But there are still other ways Liquimatic will help you cut costs. No hand application, and no changing of bars will effect substantial downtime savings for you... and Liquimatic's ease of cleaning means even further economies. Now—when production must be upped, and costs lowered—profit from Liquimatic—over and over again.

Check the other features of Liquimatic... then write today for your free copy of Liquimatic's big, new folder that tells the whole cost-saving story of Liquimatic in your buffing room.



Liquimatic ...

gives more buff mileage

These additional Liquimatic features mean real savings
in terms of time, money, safety—

- longer buff life
- completely automatic
- fast cutting
- easy cleaning
- non-settling
- high flash point
- long storage life
- sprayable viscosity
- adhesive slow-wearing buff face

PLATEMANSHIP

Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING COMPANY

Main Office and Plant, Matawan, New Jersey

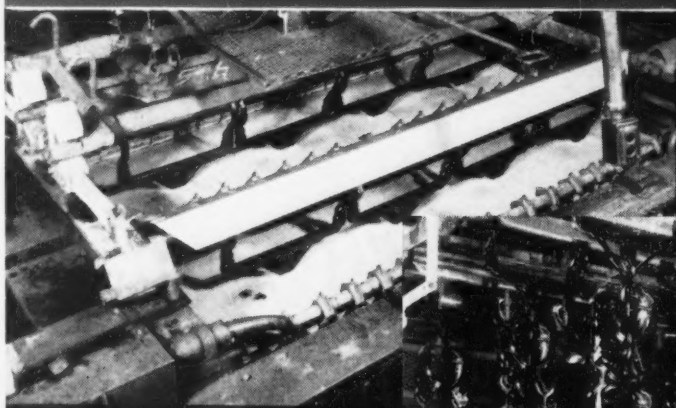
J. C. Miller Division, Main Office and Plant, Grand Rapids, Mich.

SALES OFFICES: Anderson (Ind.) • Baltimore • Beloit (Wisc.) • Boston
Bridgeport • Chicago • Cleveland • Dayton • Detroit • Grand
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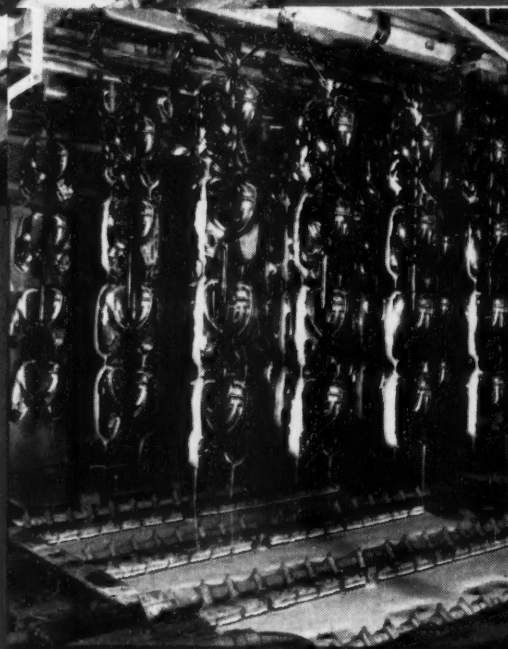
H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES



Zero-Mist creates a thin blanket of foam on the surface of the plating solutions. Under specified operating conditions losses from spray are zero.

Dragout is reduced with Zero-Mist. This saves valuable chromic acid, and greatly reduces waste disposal costs. Also note clean anode rods and hooks due to mist and spray control.



DECORATIVE CHROME PLATERS!

*Get a free sample of **ZERO-MIST**
for an easy test in your own shop*

Now you can make your own simple test of Zero-Mist—the magic new product which controls mist and spray in chrome plating baths. Udylite is making this offer to familiarize chrome platers with the many advantages of Zero-Mist.

Many chrome platers are now using Zero-Mist with amazing results. Here's what it will do for you: give absolute control of chromic acid mist and spray saving up to 30% of chromic acid loss through the ventilating ducts—reduce the workroom air pollution—cut dragout losses—lessen pollution of rinse water—save on maintenance of existing hoods, ducts and fans used in ventilating systems—cut your chromic acid losses from mist, spray and dragout up to 70%.

Write for a Zero-Mist sample today. We will send it to you free with complete instructions for an easy small scale test in your own shop. Fill out coupon below.

WORLD'S LARGEST PLATING SUPPLIER

THE
Udylite
CORPORATION
DETROIT 11, MICHIGAN

Please send a free sample of Zero-Mist with instructions which will enable us to make our own test. Mail to:

NAME _____

COMPANY _____

STREET _____ ZONE _____

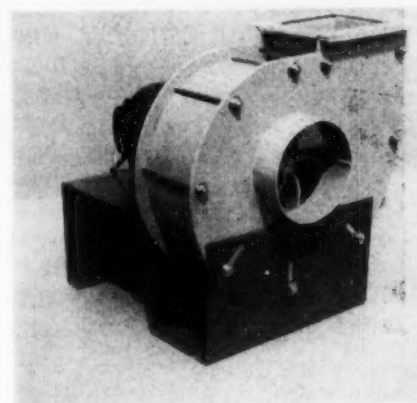
coat and unusually simple maintenance.

Many of the conveniences are due to an unusual flow system. Fluid moves through the inside of the tube and passes out the perforated wall through filter paper. The filter is cleaned by simply removing the used liner and replacing it by rolling flat sheets of filter paper and inserting them in the tubes.

Standard sizes provide for units from 1 to 36 tubes with filtration areas from 2.4 to 86.4 sq. ft. They can be ordered in a wide range of materials or lined for corrosive fluids. For full details ask for Bulletin TS-160-755.

Solid Plastic Fans for Corrosive Fumes

Heil Process Equip. Corp., Dept. MF, 12901 Elmwood Ave., Cleveland 11, O.



A complete line of Riginvin fans (rigid vinyl, high impact type) and Rigidon fans (glass fiber reinforced plastic) are now available to handle fume removal under the most severe corrosive conditions. The former are designed for use with strong acid or alkali fumes where maximum corrosion resistance is required. The latter fans are recommended for most acid services and high temperature applications to 200°F. The smooth interior surface inherent with either material increases the fan's efficiency and limits any buildup of solids carried by the fumes. The solid plastic construction affords complete exterior as well as interior corrosion resistance. High efficiency, quiet operation, and non-overloading characteristics are design features incorporated into these units.

Less expensive than equivalent rubber-lined blowers, these fans are available with variable discharge positions for either plain or flanged inlet and outlet connections.

Industrial Masking Tape

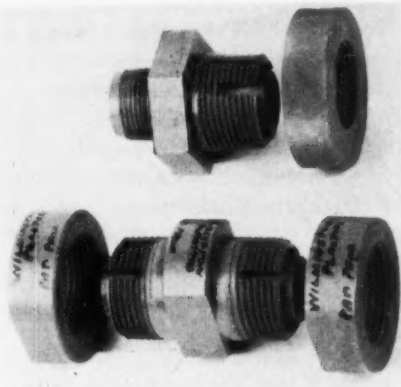
*The Laurel Hill Corp., Dept. MF,
143 S. Dearborn St., Chicago 4, Ill.*

A new industrial tape called Industrial Tape No. 4 is claimed to be a high grade tape designed to meet the most critical and exacting industrial requirements. Important features are: Exceptionally stain, solvent, and water resistant. Stands up under high temperature—to 300°F. No residue deposit, overnight or after baking. No edge curl from solvents or water. It will be available in 60 yard rolls of 1/4" to 3" widths on large cores for wrist holding.

Fittings for Polyethylene Pipe

*Wilmington Plastics Co., Dept. MF,
810 South Heald St., Wilmington, Del.*

New type couplings and adapters



for use with polyethylene pipe are injection molded from rigid unplasticized polyvinyl chloride, are resistant to corrosive action and form a tight joint without setting up undue compressive stress in the polyethylene.

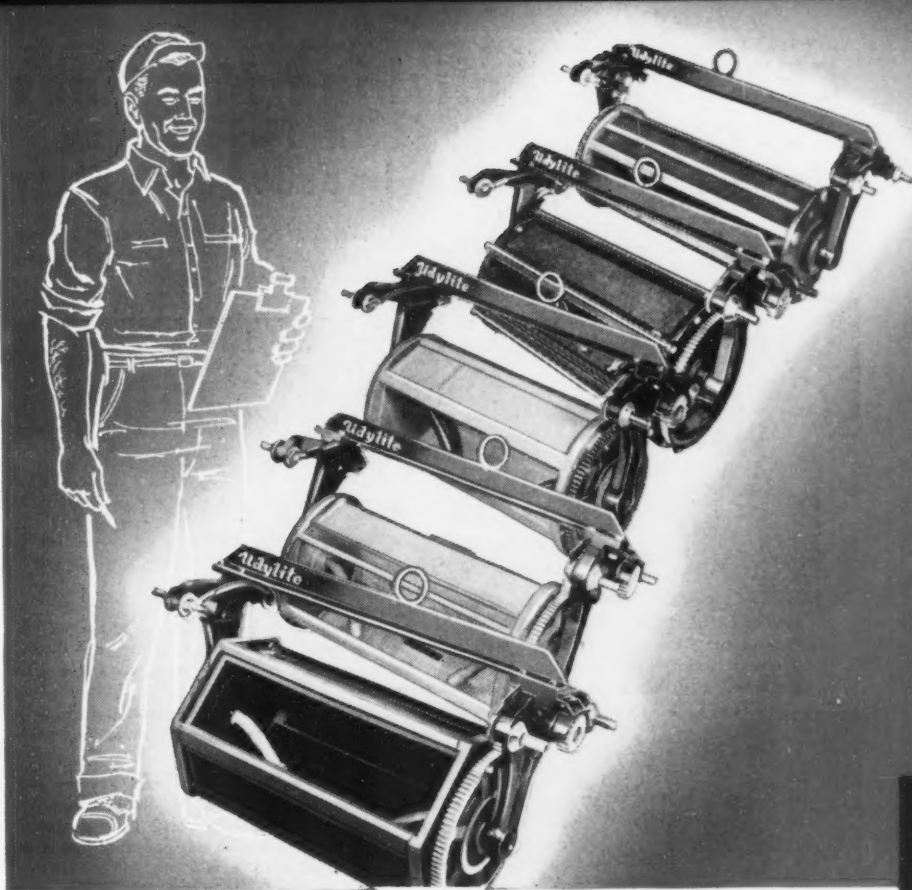
They are presently available in couplings, polyethylene to polyethylene (bottom); and adapters, polyethylene to metal (top), in 3/4" and 1" sizes. The fittings will ultimately be available up to and including 2" pipe size.

Small Lot Plating Barrels

Technic, Inc., Dept. MF, Providence, R. I.

Model OH-42 is a dual barrel electroplating unit, and Model HP-4 is a portable plating barrel. Both are made of high temperature Lucite, so that they can be used in any solution for electroplating precious metals, and will adapt readily to every other type of electroplating.

Model OH-42 is a complete barrel



ALWAYS DEPENDABLE

When you buy Udylite barrel plating cylinders you get more than good materials—you get the experienced engineering that has made Udylite barrels the best built, longest lasting, most economical barrels on the market. For Udylite barrels are constructed with the characteristics of the materials well in mind—and engineered accordingly.

Along with fine engineering Udylite is in continuous search for materials giving longer life and greater over-all economies in barrel plating. Udylite manufactures barrels of Rubber, Bakelite, Melamine, Lucite and now in turn has developed Tempron Hard Rubber.

Tempron Hard Rubber is recommended as the best plating barrel cylinder material now available, but its characteristics require special construction. Udylite's new construction (patent pending) features interlocking panels and ribs with the added advantage that panels, ribs, rails and cylinder heads are individually replaceable.

Tempron Hard Rubber has greater abrasion resistance, will handle more cleaning and plating solutions at higher temperatures including hot Stannate Tin, and with Udylite's new construction, will take the hard pounding of heavier loads day after day.

It will pay you to investigate Tempron Hard Rubber cylinders. Fill out the coupon below and mail today.

WORLD'S LARGEST PLATING SUPPLIER

We would like to discuss Tempron Hard Rubber cylinders with your sales representative. Please have him call.

NAME _____

COMPANY _____

STREET _____

ZONE _____

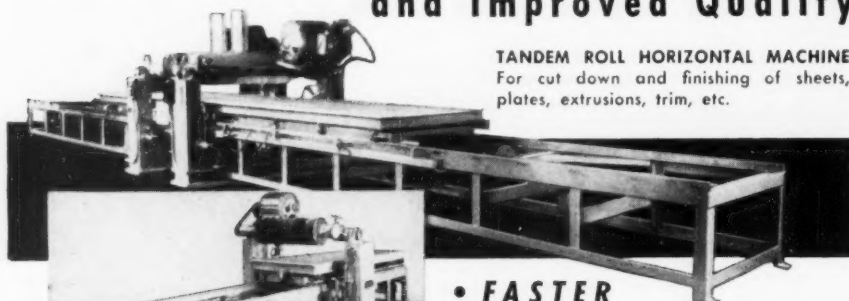
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STATE _____

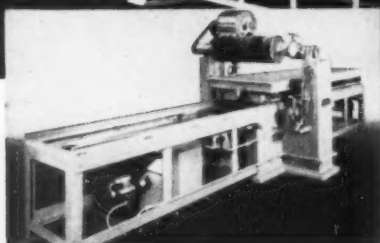
THE
Udylite
CORPORATION
DETROIT 11, MICHIGAN

CENTRAL Polishing Machines

Pay Big Dividends in Time Saved and Improved Quality



TANDEM ROLL HORIZONTAL MACHINE
For cut down and finishing of sheets,
plates, extrusions, trim, etc.



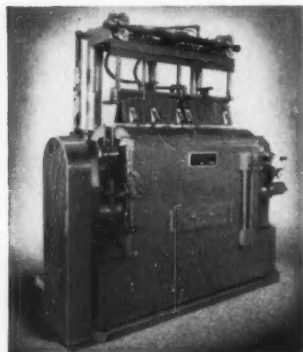
SINGLE ROLL HORIZONTAL MACHINE
Hydraulically operated, with patented
hydraulic contour device. Tables on all
machines may be oscillated sidewise.

- **FASTER**
- **MORE EFFICIENT**
- **ECONOMICAL**

For cutting costs, improving quality and speeding up your finishing operations on sheets, plates, extrusions, rods, tubing, auto trim and many odd-shaped pieces, Central Polishing Machines will meet every production requirement as they have done so successfully wherever they have been installed.

Horizontal Machines are built in single and tandem roll models, 30", 40" and 50" widths, in any length. Are hydraulically or electro-hydraulically operated from a central operator's station and equipped with our patented hydraulic contour control. Stroke adjusted from 2" to full capacity in stepless increments. Tandem rolls permit cut down and finishing operations with one set-up.

Vertical Machines are available with 18" or 36" stroke. They are fast, economical and easy to operate. Patented hydraulic contour device permits finishing many different shapes such as hardware items, handles, cutlery, auto and appliance trim, escutcheon plates, etc. Central Vertical Machines may be set in batteries where a sequence of operations is desired. Conveyor systems and fixtures can be furnished.



VERTICAL POLISHING MACHINE
2 sizes, 18" and 36" stroke. Hydraulic contour device. Gives a high finish to many odd-shaped pieces.

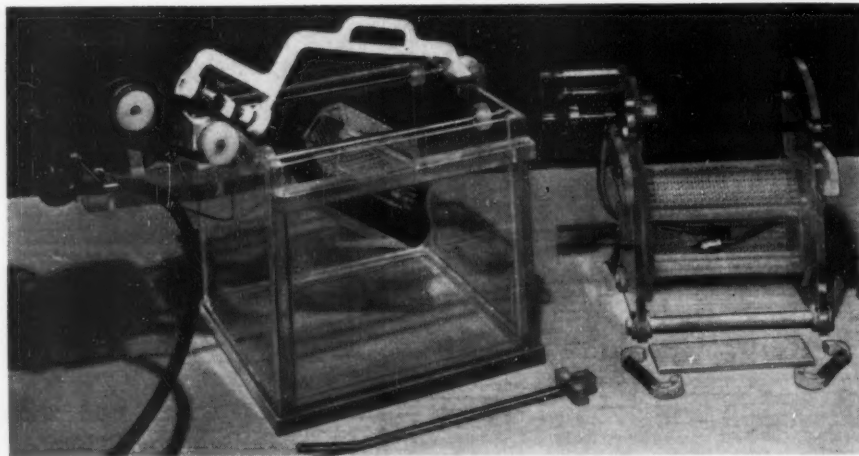
Write for full information or send us samples of work to be finished.

CENTRAL MACHINE WORKS

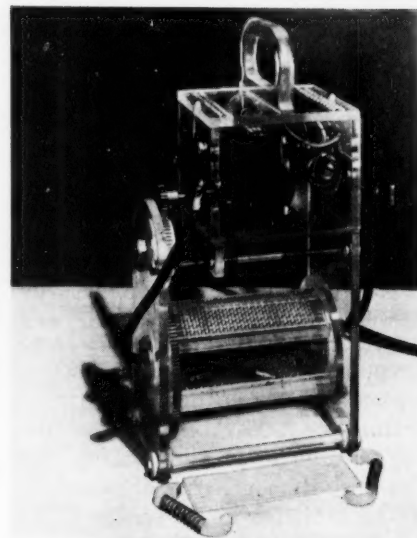
74 Commercial St. Tel. PL 6-1500 Worcester 8, Mass.

plating unit in itself, of one gallon capacity, with 60 cycle single phase

110 volt motor attached. Dimensions of the Lucite tank are 7" x 7" x 6"



Model OH-42



Model HP-4

deep. The oblique barrel is an octagon measuring $2\frac{1}{2}" \times 2\frac{1}{2}"$, and the horizontal barrel is a hexagon measuring $4\frac{1}{4}" \times 2\frac{1}{2}"$. Holes of Standard size are $\frac{3}{32}"$, and any size may be had on order. Rod for tank plating is included.

The Model HP-4 portable barrel is intended for use by immersion in any existing tank. Overall dimensions are $6" \times 4\frac{1}{4}" \times 7\frac{1}{4}"$ to the plating rods, the hexagonal barrel measuring $4\frac{1}{4}" \times 2\frac{1}{2}"$. Standard holes are $\frac{1}{16}"$. 110 volt 60 cycle single phase motor is attached.

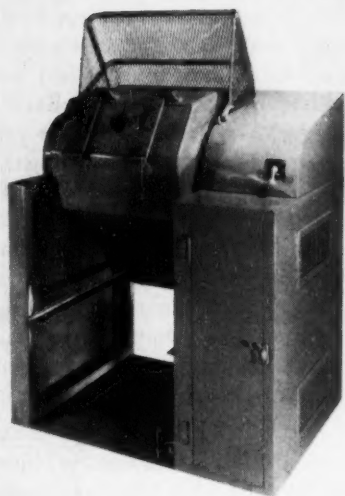
Heavy-Duty Tumbling Barrel

Lord Chemical Corp., Dept. MF,
2068 S. Queen St., York, Pa.

Lorco Model 200 is a rugged, heavy-duty barrel for precision finishing of stamped, forged, machined or cast parts. It is powered by a husky one-horsepower motor and is built to tumble heavy parts and to operate for long runs. Compartments are lined with a $\frac{1}{4}$ in. thickness of Neoprene. Drum ends and wrapper sheet are of $\frac{1}{4}$ in. steel plate, while the divider between compartments is of $\frac{3}{8}$ in. plate. Long life under severest operating conditions is assured by placing the two compartments together and using outboard bearings.

Inside dimensions of the octagonal compartments are 19 in. across from flat to flat by $9\frac{1}{2}$ in. long; each compartment has a volume of 1.6 cubic feet and will hold a total load of approximately 250 lb. Inside dimensions of door openings are 8 by 7 in.

Flexibility in meeting the requirements of any finishing job is assured by a variable-speed drive that may be



set over a range from 8 to 40 r.p.m. Motor is controlled by a drum-type forward and reversing switch to allow barrel to be run either forward or reverse. Motor and drive are wholly enclosed, but full-length door permits easy access for maintenance. A sturdy screen guard gives operator complete protection when barrel is being rotated. Two perforated drain doors allow drainage of water after tumbling. Angle irons are included in lower part of frame to support a horizontal screen for separating parts from chips when barrel is being unloaded.

Model 200 stands only 48 in. high and occupies a floor space of 31 in. deep by 38½ in. wide. Entire unit is mounted on a ¼ in. base plate for easy installation. Shipping weight is approximately 1,000 lbs.

Carbon Pile Tank Rheostat

Hanson - Van Winkle - Munning Co., Dept. MF, Matawan, N. J.

A carbon pile tank rheostat for electroplating is claimed to be particularly useful when precise current control is required. The new Universal rheostat consists of a rectangular carbon-plate rheostat, an adjustable nickel-chromium resistor, a reversing switch, a voltmeter and an ammeter.

Beside providing control of the plating current, the rheostat permits the selection of the proper tank rheostat without specifying "voltage drop." Ordinarily, this is not possible with standard knife—or rotary-type rheostats. The new unit provides all tank voltages for a specified line voltage up to 12 volts, and amperage ranging from 30 to 250.

NO TANK LINING PROBLEMS HERE...



You see, most thermoplastic sheet linings must be installed by factory-trained applicators using special equipment, but not . . .

RESILON 44

Untrained workmen — shown the simple steps — can install Resilon 44 using only a torch and a trowel. No adhesives or vulcanizing are needed. Simple "heat welding" bonds Resilon 44, bonds it so tightly to properly prepared steel or concrete, that the bond is as strong as the material itself. Joints are filled with Resilon 44 strips, then "heat welded" and smoothed. The result is an impermeable, seamless membrane with excellent resistance to acids and alkalis at temperatures up to as high as 150°F. And at an installed price way below comparable linings of equal quality. (If you prefer, we'll install it and you'll still save money.)

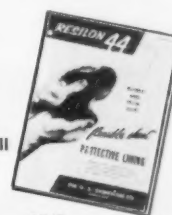
You'll want specific information on this remarkable lining material so write today . . .

and get this



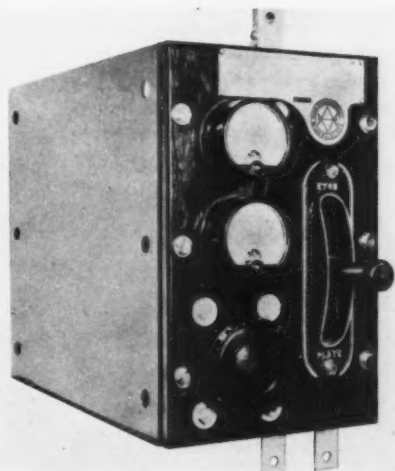
Bulletin RL-510 gives the facts on Resilon 44, including a table of chemical resistance.

We make and install many types of linings for all kinds of corrosive service. Our engineers will be glad to consult with you.



134E

This flexibility and range is possible because of the adjustable resistor lo-



cated at the top of the heavy steel case which houses the components of the unit. This feature permits basic adjustments to be made on the unit after installation. Fine current adjustments are made by the carbon pile component.

Since carbon pile rheostats provide stepless control of electrical current, they are particularly applicable where fine current adjustments are desired. Since the basic adjustments are made with the resistor, the carbon pile operates in the range of its maximum effectiveness.

The reversing switch on the rheostat reverses the current going into the plating tank. This etching technique is often used to advantage in

a special
message for
hardware
manufacturers

need a finish for protection—
decoration—identification?

specify

IRIDITE®

Specify Iridite . . . for corrosion protection during storage or use . . . for a firm and lasting base for paint . . . for extra quality and eye-appeal . . . for low cost color coding of finished parts.

ON ZINC AND CADMIUM you can get highly corrosion resistant finishes to meet any military or civilian specifications and ranging in appearance from olive drab through sparkling bright and dyed colors.

ON COPPER . . . Iridite brightens copper, keeps it tarnish-free; also lets you drastically cut the cost of copper-chrome plating by reducing the need for buffing.

ON ALUMINUM Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.

ON MAGNESIUM Iridite provides a highly protective film in deepening shades of brown. No boiling, elaborate cleaning or long immersions.

AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

WANT TO KNOW MORE? We'll gladly treat samples or send you complete data. Write direct or call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

Iridite is approved
under government
specifications



ALLIED RESEARCH PRODUCTS
INCORPORATED

4004-06 E. MONUMENT STREET • BALTIMORE 5, MD

Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems
on Non-Ferrous Metals, ADP Plating Chemicals,
WEST COAST LICENSEE: L. N. Butcher Co.

chromium plating to obtain good adhesion. The unit is equipped with ammeter and voltmeter, although individual units may be specified without either or both, and is available in four sizes. The smallest unit is rated at 30 or 60 amps, with plating line voltages up to 12 volts. The largest is rated at 125 or 250 amps over the same voltage range. All units are mounted in heavy steel cases that are open at top and bottom for ventilation. The carbon pile component is composed of rectangular carbon plates that are formed into a single pile and housed in a one-piece steel box.

Proportioned for moderate temperature rise, the new rheostat operates at lower temperatures than multiple-tube or standard rheostats. Resistance changes range as high as 50 to 1.

Stripper for Zinc Chromate Primers on Aluminum

*Oakite Products, Inc., Dept. MF,
118 Rector St., New York 6, N. Y.*

Oakite Stripper No. 110, designed to remove zinc chromate primers from aluminum without affecting the metal surface, is a two-phase solvent material, which is used full strength. The part to be stripped is immersed completely in the solvent, under the surface oil seal, which should be maintained continuously. According to the manufacturers, the material will remove zinc chromate primers and other finishes from aluminum with complete safety when used as recommended. The stripper has a flash point of 290° F., and does its job faster when heated to 140° to 180° F. A pressure water rinse, warm or cold, is recommended to float off the loosened paint.

Glass Electrodes for pH

*Beckman Instruments, Dept. MF,
Fullerton, Cal.*

A new type of pH-sensitive glass which will benefit both laboratory and process control users of pH equipment is now being incorporated into certain pH electrodes manufactured by the above company.

Known as E-2 glass, the new formula, which represents considerable research and development work, is especially suited for high pH measurements. Type E-2 glass replaces Type F glass in the original and widely-used Beckman blue-tipped, alkali-resistant electrodes.

Electrodes with the new formula glass are extremely valuable in the range above pH 10 where other electrodes fail to perform satisfactorily. Unlike older electrodes, they are also good over the entire 0-14 pH range at temperatures from 15 to 100°C. and offer improved resistance to acids, surface deterioration, aging and alkalis.

The electrodes are available for use with Beckman Models G, M, N, H and H-2 pH meters and Beckman industrial pH flow and immersion assemblies.

Wax for Sealing Metal Coatings

Glyco Products Co., Inc., Dept. MF, Empire State Bldg., New York 1, N. Y.

A synthetic wax, Acrawax C, has unusual properties which makes it particularly effective as an anti-corrosion sealer. It has a high melting point, 284°-290°F. (140°-143°C.), is insoluble in water, sea water, dilute acids and in many organic solvents. It melts to a low viscosity liquid just above its melting point which makes it easy to apply.

Small parts should be dipped in a tank of wax at a temperature slightly above 290°F. The parts are left in the tank for about an hour depending on the thickness of the metal coating. A five-minute dip is satisfactory if the parts are preheated to 300°F. Parts too large to dip should be preheated to 300°F. and then brushed with melted wax until no more wax is absorbed.

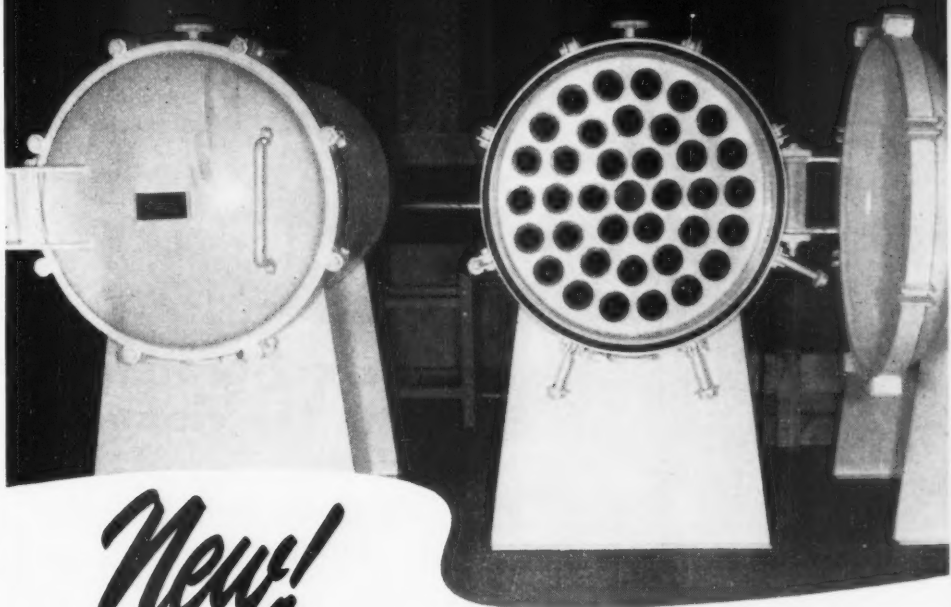
Solvent Vapor Degreaser

Baron Industries, Dept. MF, 241 West Ave., 26, Los Angeles 31, Cal.

The above manufacturer has extended his Baronet series to include two rectangular shaped vapor spray degreasers for larger sized parts and heavier work loads.

These compact degreasing machines are fabricated of 12 gauge and $\frac{3}{16}$ " plate for longer life, and are protected against corrosion with a fused phenolic interior coating. These new models retain all the low cost advantages of the barrel degreasers while providing such heavy duty features as a full water jacket, offset coil condenser and complete manual spray equipment.

Available in two sizes, these new machines have unobstructed working dimensions of either 36" or 48" in



New!

TUBULAR FILTERS by Industrial

**WITH IMPORTANT NEW FEATURES
DUE TO FLOW FROM INSIDE OF TUBE**

- ★ Unequaled simplicity of maintenance.
- ★ Solids can be recovered in dry form.
- ★ Liners are easy to replace and inexpensive.
- ★ Ideal for intermittent or continuous operation.
- ★ Chamber can be emptied without losing cake.
- ★ No unfiltered "heel".
- ★ Can be used with or without pre-coat.
- ★ Ideal for polishing . . . as a trap filter . . . and as a scavenger for larger filters.

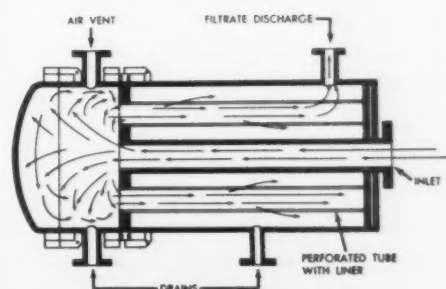
NEW SIMPLIFIED OPERATION

The filter is prepared for use by simply rolling flat sheets of filter paper and inserting them in the tubes, which are designed to force the paper snugly against the tube wall.

EASY TO CLEAN

Filter papers are simply withdrawn and replaced. Even the tubes are easy to remove, being held in place by a simple rubber O-Ring device. Except for the cover there are no nuts and bolts to handle.

FLOW DIAGRAM



FOR FULL DETAILS WRITE FOR BULLETIN TS-160-755.

CENTRIFUGAL PUMPS

PRESSURE FILTERS • ION AND HEAT EXCHANGERS • RUBBER LININGS • WASTE TREATING EQUIPMENT

Industrial

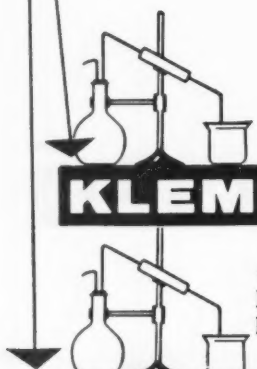
INDUSTRIAL

FILTER & PUMP MFG. CO.

5906 OGDEN AVENUE • CHICAGO 50, ILLINOIS

Have You A Paint Adhesion Problem?

Klem Offers 2 Standard Products for cleaning and Phosphatizing that Meet Practically Every Situation



KLEM "Minit-Kote"

**1
STAGE**

An economical, fast one-stage cleaning and phosphatizing solution for use where the problem is not complicated.

KLEM "Klem-Kote"

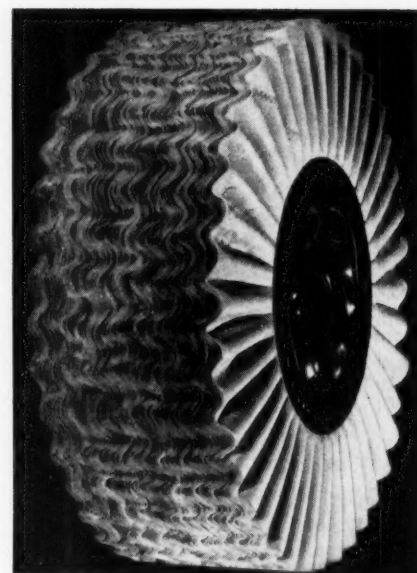
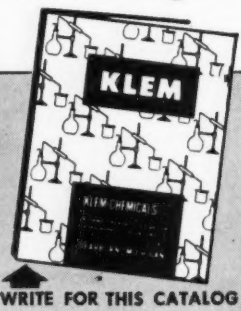
**3 & 5
STAGE**

A multiple stage cleaning and phosphatizing compound for use where removal of rust, grease and foreign matter offers a tough cleaning problem.

KLEM

CHEMICALS, INC.

14401 Lanson Ave., Dearborn, Michigan
1905 Central Ave., El Monte, California



ing which results in 23% more strong warp fibers per inch of fabric on the working surface of the buff, one-way warp direction for maximum cutting and polishing efficiency, uniform convolution pleats for better fabric distribution and perfect balance, forced air ventilation through air scoops in the center of the buff, and piano wire stitching for greater safety when operating at maximum speed.

Addition Agent for Chromium Bath Throwing Power

Wagner Brothers, Inc., Dept. MF, 418 Midland Ave., Detroit 3, Mich.

A new liquid addition agent called "Krome-On" is claimed to materially increase the throwing power of chromium plating baths.

In addition to the advantages of increased plating efficiencies, the material is stated to furnish a superior mist-inhibiting blanket to reduce spray and flue loss, thereby saving chromic acid waste. Reduced drag-out also minimizes waste disposal problems.

The product is now available from company representatives in Chicago, Cincinnati, Indianapolis, Rochester, New York and Detroit.

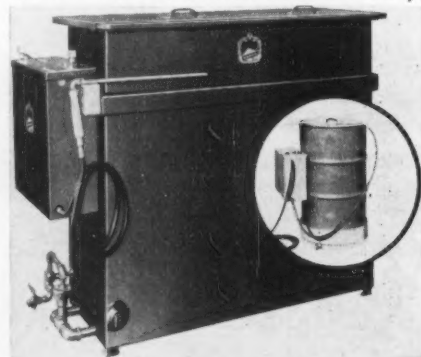
Germanium Rectifiers

Walker Division, Norma-Hoffmann Bearings Corp., Dept. MF, Stamford, Conn.

A new line of germanium rectifiers is available in several models in various amperes d.c. output to meet most requirements. They are claimed to offer users greater efficiency over other types of conversion equipment.

length, width 18" and vapor depth 24".

As little as twelve gallons of trichlorethylene is required for operation and considerable savings can be realized by the degreaser's reclaiming feature. When the solvent becomes dirty,



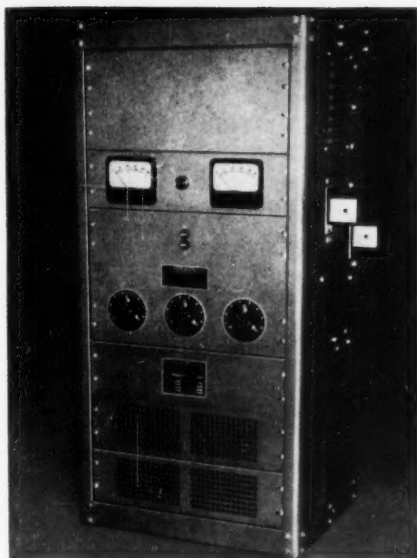
it can be automatically reclaimed within the machine for further use.

Immediate delivery can be made in gas, steam, or electrically heated models. The units are shipped assembled and wired, complete with switches, work rest, special leak proof pump and motor, solvent resistant spray hose, aluminum spray lance and special slide-off lid.

Air-Cooled Bias Buff

James H. Rhodes & Co., Dept. MF, 48-02 29th St., Long Island City 1, N. Y.

The Colossus, a new and completely different type of air-cooled bias buff is claimed to feature such improvements as 45 degree angle fabric bias-



Because there are fewer moving parts, maintenance costs are practically nil compared to other large D.C. power supplies. Since germanium rectifiers require fewer components than conventional rectifiers, and because of their high efficiency, they are smaller in size, and can be installed in a smaller floor area, according to company claims.

Chromium Plating Processes

Tiarco Laboratories Corp., Dept. MF, Clark, N. J.

The above firm has announced that they have developed a process for plating titanium with chromium, called the Baylig process. It is claimed that this process is the first to successfully plate titanium directly with chromium without any chipping or peeling under the most severe tests.

The company has also developed similar processes for chromium plating aluminum and steel directly, and is issuing licensing agreements whereby manufacturers and commercial concerns will be allowed to use one or more of its processes under a royalty arrangement.

Ultrasonic Generators

Acoustica Associates, Inc., Dept. MF, Glenwood Landing, L. I., N. Y.

Low cost high frequency rotating generators ranging in size from 2 to 150 kilowatts, recently announced, are capable of supplying economical power for energizing multiple arrays of above-audible sound generating transducers. As a consequence, the favorable results of laboratory ultrasonic experimentation can now be extended into full-scale plant production.

You Are Paying

FOR A ...

Hammond JUNIOR AUTOMATIC

WHY NOT USE IT!



Model SE2SF with
Hammond Polishing Lathe

Finishing costs are high and will go higher as buyers insist on better finishes — they're doing it. There is only one answer to this situation — **FASTER AND BETTER FINISHING EQUIPMENT.**

Polishing by hand is hard and slow work. With a Hammond Junior Automatic the operator merely loads and unloads, resulting in high production and uniform finishes throughout the day.

Hammond Junior Automatics soon pay for themselves. If you are interested in reducing finishing costs—send one finished and several rough samples for complete engineering report — No Obligation.

Hammond Machinery Builders INC

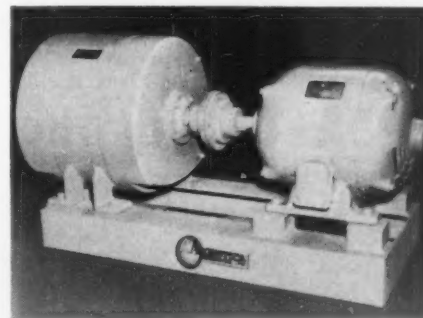
1601 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN

VISIT US AT BOOTH 1453, METAL EXPOSITION, PHILADELPHIA — OCTOBER 17-21

The above manufacturer is now able to supply various sized production systems consisting of banks of magnetostrictive or ceramic-type piezoelectric transducers which may be submersed or externally mounted in existing equipment and which are driven by an appropriately rated high frequency motor driven alternator. An untrained operator can work and service this practical and foolproof system.

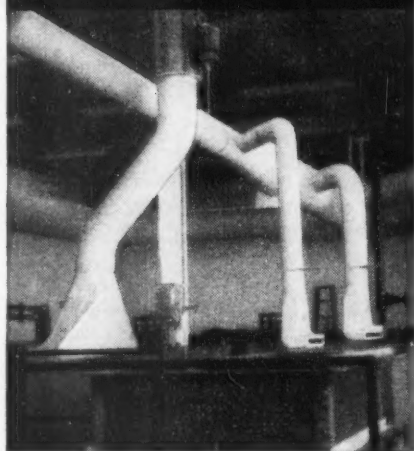
For example, the 230 volt, 20,000 c.p.s. single phase, 5 Kw. generator illustrated, driven by a 15 H.P., 3 phase, 60 cycle, 220-240 volt A.C. squirrel cage induction motor, will energize up to 10 submersed 400 watt

transducers of any type strategically located in a typical cleaning and degreasing system. Each transducer will cause copious cavitation through a large field in the solution. The explosive forces caused by the collapse and formation of millions of entrapped





Specify PLA-TANK[®] for your DUCT SYSTEM



Illustrated above is part of a new PLA-TANK Duct System which is typical of dozens being installed for fume exhausts in plating rooms, maintenance shops and chemical processing plants. PLA-TANK was chosen for the entire system from hoods to raincaps on the outside stacks.

Included in the system (in addition to hoods, ducts, stacks and caps) are molded PLA-TANK fan housings and propeller-type fan blades. *Everything that contacts the fumes is molded of chemical-resistant PLA-TANK.*

PLA-TANK, molded from long-life, resin-bonded glass fibre laminate is resistant to a wide variety of fumes and temperatures. It is lightweight, easy to install, competitively priced.

PLA-TANK can be the answer to your duct system problem. Let us help you the modern way — with PLA-TANK.

First in the field — and still the leader

Send for free data sheets

PLA-TANK, INC.

DIVISION OF

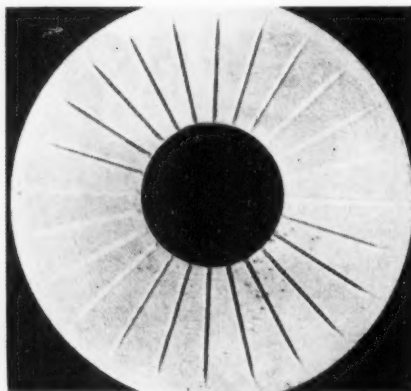


Dept. 58 • West Warren, Massachusetts

vapor bubbles at the rate of 20,000 times per second is in the order of several hundred atmospheres pressure.

New Porous Teflon and Kel-F Filters

*Porous Plastic Filter Co., Dept. MF,
30 Sea Cliff Ave., N. Y.*



The above manufacturer announces a new design and a sharply reduced price in Porous Teflon and Kel-F in-line filters.

The porous fluorocarbon filters are of hitherto impossible all welded construction with molded flow passages and are designed for easy disassembly and cleaning. Great compactness has been achieved with a square foot of filter area contained in a volume 2" high and 3 1/2" O.D.

Sizes up to 10 square feet at prices up to 55% lower than old style units are available for quick delivery.

Industrial Solvent

*Chem Industrial Co., Dept. MF,
3784 Ridge Road, Brooklyn 9, O.*

A new, highly efficient solvent that can be used with complete safety for most industrial applications is known as C-I-SOL. It is reputed to have cleaning properties closely resembling those of carbon tetrachloride even though it is up to 20 times less toxic. Because of this, heavier and more effective concentrations can be utilized without exposing workmen to possible dangerous effects.

In addition to its low toxicity, the material is non-flammable. As a result, fire hazards when working near an open flame or next to grinding operations are eliminated.

The product is recommended for removing grease, wax, oil and tars from metal products, hand tools, machine tools and components, sheet metal, tubing, etc. Although not suitable for

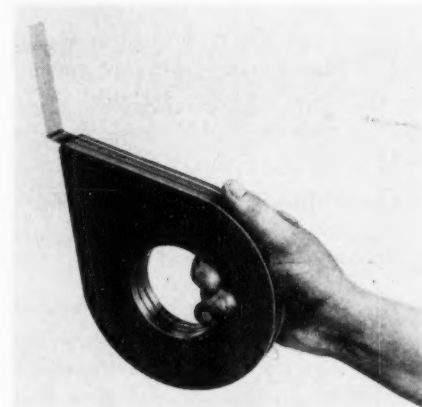
vapor degreasing, it is adaptable to cold cleaning, dip cleaning and bucket cleaning.

The solvent is available in 1-gallon cans, 5-gallon pails and 55-gallon drums.

Tape Applicator

*GorDag Industries, Inc., Dept. MF,
2215 Foshay Tower, Minneapolis 2,
Minn.*

Complete elimination of waste, fast and accurate application and simplicity of operation are three features of the Tape Rite applicator, a new one-hand dispenser for all pressure-sensitive tapes. The device can be used wherever masking, sealing or joining tape is required. Tape pays out of the applicator and is firmly attached to the job surface by a resilient steel "finger"; when the correct point is reached, the unit is rolled over, and



the serrated edge of the "finger" cuts the tape in the desired spot.

Tight construction keeps tape clean and moist, the manufacturer states. The tape cannot be twisted or snarled, and economy is claimed because of waste elimination and ease and speed of application.

Made of steel and finished in green metallic enamel, the unit will accommodate tape 3/4" or 1" wide with a standard 3" core; size should be specified when ordering. Weight is only 12 oz., and list price per applicator is \$2.39 f.o.b. Minneapolis.

Fiberglass Reinforced Pipe

Reinforced Laminates, Inc., Dept. MF, 3061 E. Hennepin Ave., Minneapolis 13, Minn.

A new line of fiberglass reinforced plastic pipe is intended for use under corrosive conditions, since the thermosetting resins which are used give

excellent resistance to most acid and alkaline solutions. In addition, this new pipe can be built for service where moderately high pressures and temperatures are encountered. Engineering design values have been established by controlled, long-term tests.

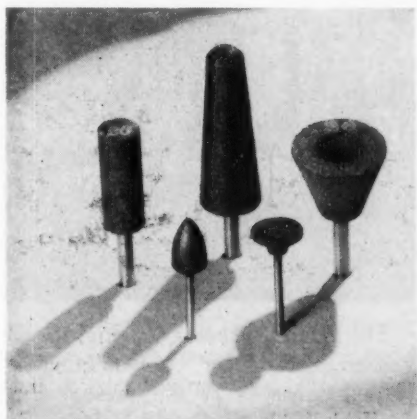
The method of fabricating is such that the fiberglass reinforcement can be oriented to provide needed strength for different requirements. A selection of resins (principally modified epoxies) is available for special needs.

The following nominal inside diameters are now available: 1 3/4", 2", 2 1/2", 3", 4", 6", 10", and 12". Lengths are 20' random except on the smallest diameters which are 10' and 15' random. Almost any diameter and wall thickness up to 36" diameter can be supplied on a custom-built basis without excessive tooling costs.

Couplings and other fittings of several types are available with standard sizes. Cost varies with the construction which is required; but is generally lower than stainless steel, Monel metal, etc. it is claimed.

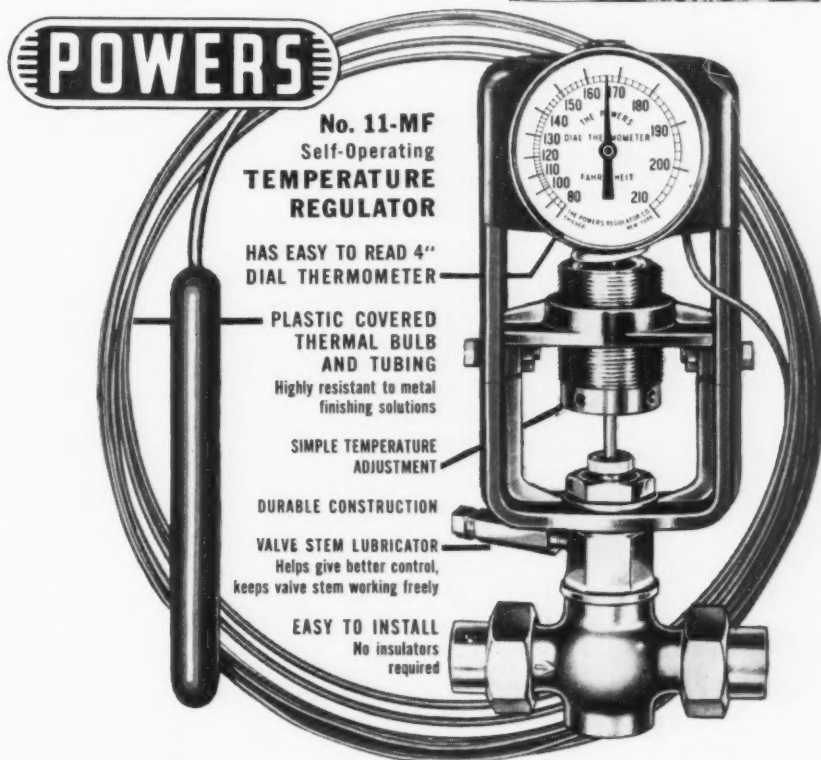
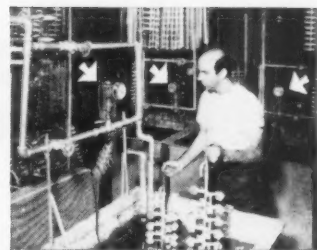
Resin Bonded Abrasive Wheels

American Diamond Saw Sales, Dept. MF, 120 N. W. Ninth Ave., Portland 9, Ore.



A completely new line of high speed resin bonded wheels and points, designed to operate at 20,000 R.P.M. and above, has just been announced. The wheels afford the metal finisher, particularly the stainless steel fabricator, considerably faster cutting action and longer wheel life, states the above manufacturer. They are coded to indicate the degree of hardness of the bond and are available in the standard grits from 24 to 120 and sizes and shapes to conform to national standards.

For Plating, Cleaning and Rinse Tanks



Simplest, Most Reliable Control Made
Holds Temperature at the Right Point
Savings Often Repay Its Cost 2 to 6 Times a Year

Why Powers No. 11-MF Regulator Gives Better Control and Lasts Longer— better TEMPERATURE Control results from powerful bellows and minimum of valve stem friction. Valve Stem Lubricator aids easy movement of valve stem without binding. Double ply metal used in Powers bellows outlasts ordinary single ply type. Greater durability of plastic covered bulb and tubing also helps prolong the life of the regulator.

Dial Thermometer indicates temperature of solution under control. It gives a visual check of the process and makes it easy to adjust regulator for different temperatures.

Eliminate "the human element" in temperature control with Powers automatic Regulators. They're simple, compact and dependable. They stop OVER-heating, prevent "boil-overs," waste of steam, water wasted by evaporation, burnt plated parts, rejects, decomposition of costly additives and loss of volatile ingredients from cleaning solutions.

Powers Nationwide Service and 24 Hour Delivery in the U.S.A. are important time and money saving advantages. Order a Powers No. 11-MF Regulator now. Call your supply firm or write us direct for Bulletin 330 and prices.

(c43)



THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | Offices in chief cities in U.S.A., Canada and Mexico

Over 60 years of Automatic Temperature and Humidity Control

Nice Product, Nice Package

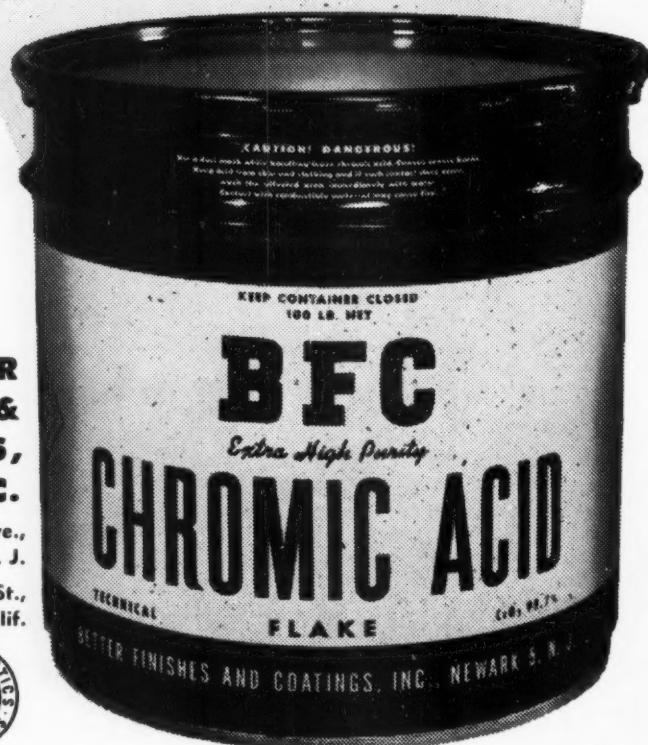
Folks often wonder why we spend an extra 1/4¢ a pound out of our own pockets for a lithographed drum. Fact is we're proud of the quality of BFC Chromic Acid and figure it deserves a bright, colorful container.

Every batch gets checked against a tough quality spec. Off-grade acid goes on the dump. Only top-quality material goes into those shiny BFC drums. Send us a modest order and see for yourself.

BETTER FINISHES & COATINGS, INC.

268 Doremus Ave.,
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2014 East 14th St.,
Los Angeles 21, Calif.



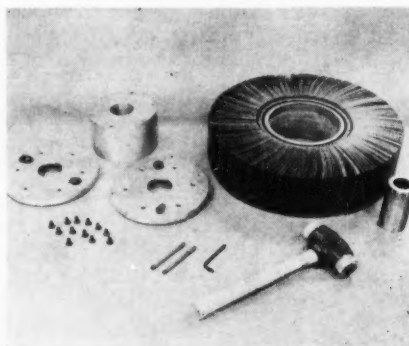
Polishing Wheel

Minnesota Mining & Mfg. Co., Dept. MF, 900 Fauquier St., St. Paul 6, Minn.

A new device which makes possible a new method for polishing all types of metal for plating, painting, or architectural finishing, without the use of fine grit set-up wheels, rag or sisal buffs, or brushes, is called the "PG" wheel (polishing and grinding wheel). It consists of hundreds of pieces of cloth coated abrasives factory-formed into a wheel that can be used on rotary or straight line automatics, or on standard lathes for hand operations.

The wheel differs from any other product currently available, according

to the above company, in that it removes stock as part of its polishing action. This abrading-polishing action and the wheel's ability to conform enable it to remove mild draw marks in the same process in which it generates a buff-type finish.



One of the major features of the wheel is that its rate of cut and the micro inch finish it produces remains constant from the beginning of a new wheel until it is worn down to the hub. It is not necessary to increase arbor speed to maintain cut during the life of the wheel.

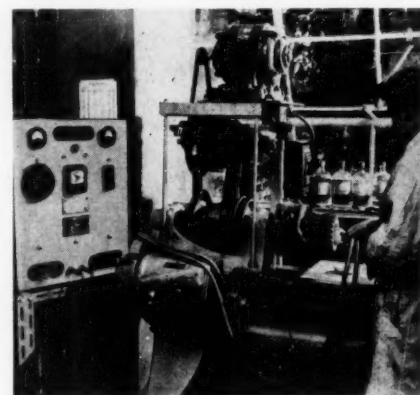
Some of the other major advantages of the wheel include: greatly reduced downtime on automatic equipment; the wheel is cleaner than a buffing operation since it uses oil instead of a compound; and the wheel remains sharp throughout its life because fresh mineral grain is exposed as the wheel wears.

The wheel is adaptable to hand or automatic operations, and will take the shape of the part being polished. The shape will remain constant during the life of the wheel.

Lubrication, of the type presently used with some buffing and intermediate finishing operations, also helps develop better wheel finishes and longer wheel life.

Selective Plating

Dalic Metachemical, Ltd., Dept. MF, 121 Leicester Ave., Toronto 18, Can.



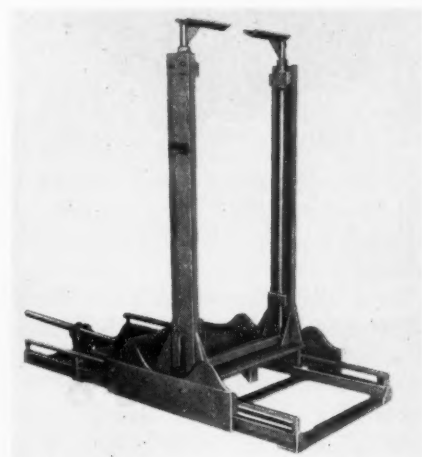
The Dalic process, a highly advanced method for electroplating localized areas is at the present time available in the U. S. and Canada. The process utilizes a newly designed group of air and water-cooled styluses and a complete range of special non-toxic metallo-organic solutions. These solutions are capable of plating small areas at amazingly high current densities, in some cases as high as 6,000 amperes per sq. ft., it is claimed.

Automatic Parts Transfer

Wagner Brothers, Inc., Dept. MF, 418 Midland Ave., Detroit 3, Mich.

The new Auto-Loader is a completely automatic parts transfer mech-

anism which can be adapted to any automatic metal finishing mechanism operating with an intermittent motion. Originally designed for automatic electroplating machinery, it also finds application in any automatic parts finishing operation such as anodizing,



phosphate coating, etching, electropolishing, oxide coating, painting, cleaning, etc.

The primary advantage of the new mechanism is that it eliminates the labor costs of manual loading. In addition, the size and weight of loaded racks no longer need to be limited by the worker's strength. Its rugged construction will take the heaviest loads; its absolute simplicity of design minimizes maintenance to an occasional oiling of the bearings. And, unlike some loaders, the device will accommodate a monorail conveyor system which operates on different planes, according to the above manufacturer.

The transfer mechanism is mounted on a reciprocating carriage, moving on rollers in a channel track. Cam followers attached to the lifting arms duplicate the eccentric contour of the side plates to raise and lower the lifting arms into the loading and unloading positions. The cycle of the loader is controlled by the limit switches of the automatic processing machinery, actuated by an hydraulic cylinder, or an electric drive, to move in perfectly-timed unison with the transfer cycle of the automatic. Processed parts are unloaded from the automatic onto the monorail conveyor as unprocessed parts are loaded from the monorail onto the automatic.

TECH-TIN

Pure Tin Plate in 5 to 60 seconds by immersion only

Tech-Tin deposits a pure tin coating on brass and copper surfaces by immersion at room temperature — no electrical current, no expensive equipment required. Low-cost Tech-Tin quickly provides a good soldering surface and mild protection against corrosion. Recommended for parts identification, decorative effects, inside coating pipes and tubes, etc. Excellent for economical bulk finishing.

Send \$2.00 or purchase order for sample and instructions.

TECHNIC INC.

Jackson 1-4200



PROVIDENCE 1
RHODE ISLAND
U. S. A.

TECHNIC INC., 39 Snow Street, Providence, R. I.

Send us prepaid sample pound of Tech-Tin with instructions for rapid immersion plating. Check (or purchase order) for \$2.00 is enclosed.

Company _____

Address _____

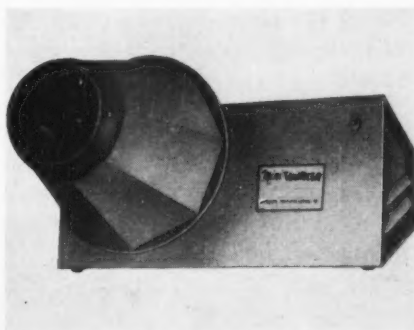
Send Attention of _____

THE LARGEST ENTERPRISE OF ITS KIND IN THE WORLD

New "Mini-Tumbler"

Rampe Manufacturing Co., Dept. MF, 14915 Woodworth Ave., Cleveland 10, O.

To round out its line of medium priced barrel finishers, the above firm,



announces its new Mini-Tumbler. As the name implies, this is a small bench tumbler with one gallon volume barrel. Despite its small size this unit is claimed to be sturdily built with heavy construction and parts to stand up under continuous operation on the tumbling of small parts in laboratories, foundries, plating shops, screw machine shops, lapidary shops and industry in general. The manufacturer states that it will turn out work at the same speed and of the same quality as larger tumblers and at a saving in production cost and factory space.

The tumbler is available with either open or closed barrel. All barrels are vinyl plastic coated. Power is furnished by a 1/2 H.P. split-phase, 110 volt, 60



MODEL OP2

CIRCO DEGREASERS

- Will last twice as long!
- Reduce solvent costs 30% or more!
- Cut labor costs!
- Up to 40% less maintenance!

NOTE THESE FEATURES . . .

1. **Unobstructed tank walls.** Condensing coil and condensate pan are recessed providing superior vapor control, effective solvent reclamation and unobstructed working area.
2. **Demand type water control.** Insures using water only when needed, thereby reducing operating cost. Placement of nickel plated condensate coils in conjunction with new type water control eliminates water condensation along the side-walls of degreaser, thus, preventing rusting of the sidewalls and acid solvent, increasing the life of the degreaser.
3. **New pump design.** All pump parts are fabricated of stainless steel. The rotor and end plates are nickel clad. Rotating magnetic field drives impellor, thus, the pump is completely sealed except the intake and outlet, preventing leakage.
4. **Lower height.** Working height reduced for easy operation.
5. **Built-in storage tank.** Holds adequate reserve for flushing in addition to entire contents of degreaser sump.
6. **Less floor space.** Designed to operate from either side.



SINCE 1923
130 Central Avenue, Clark (Rahway), New Jersey Offices in principal cities
PER-SOLV (Perchloroethylene) CIRCO-SOLV (Trichloroethylene)
Vapor and Ultrasonic Degreasers • Metal Parts Washers • Dryers • Solvent Recovery Stills

OVER 208 STANDARD MODELS... including Circosonic ultrasonic degreasers. All backed by nation-wide technical field service.

YOUR INQUIRY BRINGS comprehensive 32-page vapor degreasing manual.

cycle, A.C. motor. Net weight is 25 pounds; color is green. The machine cabinet measures 16" long by 9" wide by 7 1/4" high, showing the small amount of bench space required. With open barrel it sells for \$110.00 F.O.B. Cleveland, Ohio.

The manufacturer will gladly send information on Mini-Tumbler or other sizes of barrel finishers up to 8 cu. ft.

Heat Exchanger

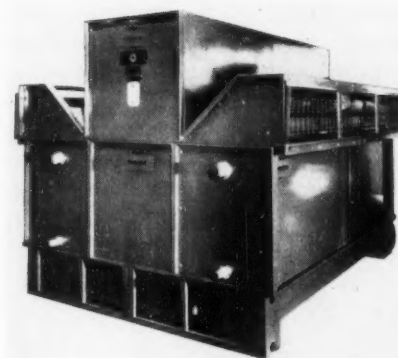
Niagara Blower Co., Dept. MF, 405 Lexington Ave., New York 17, N. Y.

This new apparatus provides water saving in industrial cooling and gives close control of temperatures (within 2°F.), according to the above manufacturer. The new machine, which is patented, is named the Panel Casing

Aero Heat Exchanger. It cools by evaporation and obtains the temperature control by modulating the use of outdoor air.

The fluid to be cooled flows through two parallel-mounted coil sections both of which are continuously kept drenched with a water spray. A portion of this water evaporates while the balance is recirculated by a pump. Air enters through dampered intakes above the coils, travels downward through the sprays and then enters a central plenum between the two sections, at which point the entrained moisture is eliminated. The air then moves upward and a propeller fan ejects it into the atmosphere.

The fluid in the cooling coils is effectively cooled to a point close to



the atmospheric wet bulb temperature. About 1,000 BTU are transferred, through the wet coil surface to the air stream, for every pound of water evaporated. The action of the air recirculation system holds the temperature constant. Cooling capacity varies directly with the heat input load. The gradual action of the dampers, admitting more air when more cooling is called for, controls the evaporation of the water spray and holds the desired temperature without "hunting" action. If heat is required instead of cooling it is provided either with steam or electricity by a heater in the spray water tank. Much expense is saved because the equipment is designed to be completely assembled on the installation site. Since the casing is shipped as flat panels instead of box-like shapes the ratio of space to weight, and the freight bills, are low. The tank is first installed on the owner's foundations or, at his option, may be built of concrete according to drawings furnished. The coil sections are assembled over the tank and enclosed in panels. Above them the intakes are installed and over the central portion the fan section is erected. This creates the central plenum. All panels are removable, any of them may be taken down for access to the interior, painting or any maintenance work. This assures long life and simple upkeep. The spray nozzles are non-clogging; nothing that will pass the pump screen will lodge in them.

The heat exchanger may be installed anywhere; the usual location is outdoors, on the ground or on a roof. In this model there are four sizes affording capacities from 7,000,000 to 18,000,000 BTU/hr. under standard conditions. The maximum space required in ground plan is 194" by 140 1/2"; in height 125 5/8". The weight range is from 9,300 to 20,500 lbs., approximately. The manufacturer also builds

both smaller and larger units in other types.

Black Finish for Aluminum

*Birchwood Chemical Co., Dept. MF,
4500 West 44th St., Minneapolis,
Minn.*

Called Alumblack, a new cold chemical finish perfected for aluminum gives a soft or high gloss finish immediately upon application. Only 1 minute is required for drying.

The surface tension of the product is very low which means it can be dipped, sprayed or applied with a rag or brush. There is no surface spotting or density variation and, if left unrubbed, a dull gloss finish is obtained. If rubbed, a high-gloss, satin-smooth finish will result. Inasmuch as the finish penetrates the metal surface, there is no measureable tolerance deviation, according to company claims.

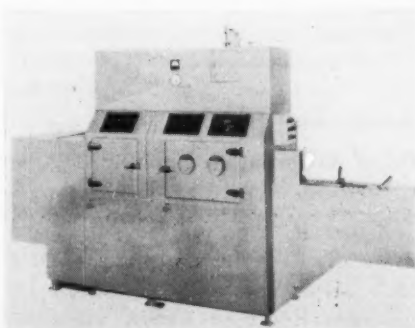
Delivery can now be obtained in 30 days for small parts finishing and touch-up. For larger commercial quantities, delivery will take 90 days.

Automatic Wet Blast Machine

*The Cro-Plate Co., Inc., Dept. MF,
747 Windsor St., Hartford 1, Conn.*

A new, automatic Pressure Blast wet blast unit for the finishing of jet engine compressor blades finishes both sides of the airfoil section at the rate of approximately 200 per hour, removing heat treat scale and discoloration without stock removal or distortion. The unit also incorporates a rinse facility for the removal of abrasive compound after blasting.

Blades are manually loaded on simple work holding fixtures which grasp at the root. A conveyor indexes blades into the blasting chamber where a series of moving guns actuated by an air hydraulic cylinder accomplish the finishing operation. Blades are then automatically indexed into the rinse cabinet and around to



the original load section where they are manually unloaded.

BUSINESS ITEMS

Nankervis Buys American Motors Plant

The *George L. Nankervis Co.* announced it has purchased a 72,000 sq. ft. manufacturing plant formerly occupied by the Nash Division of the American Motors Corp. Located on a five acre plot at Fullerton and Whitcomb, the facility consists of a one and two-story brick and steel structure, complete with rail siding and off-street

parking space. It was also announced that plans were being readied for a 12,000 sq. ft. addition to the plant for executive and general offices and an engineering drafting room. Extensive plant changes are also contemplated.

Floor area in the new plant will double the amount now available to the company for its operations, which include laboratory and production testing equipment for the automotive and aircraft industries, in addition to the engineering and installation of electro-plating systems.

The acquisition of the plant marks the sixth expansion of the company in the past five years. It currently occupies three buildings at 19255 West Davison and at 19200 and 19203 Glen-

FORMAX

the Perfect Combination

**FROM START
TO FINISH**



**ZIPPO
CLOTH
BUFFS**

These famous long-wearing buffs run cool under all buffing conditions. High count bias-cut cloth is assembled on ventilated steel centers. Each section is perfectly balanced and faced—requires no raking.



**BUFFING
COMPOUNDS**

Formax produces a complete line of buffing compounds in bar, tube and liquid form. Our extensive manufacturing, laboratory and testing facilities are at your disposal.



**ZIPPO
SISAL
BUFFS**

You have a pleasant surprise coming if you haven't tried the new Zippos bias-type sisal buff. It was specifically developed for steel buffing—to blend polishing grit lines—to cut down stainless steel—and bring up a bright lustre.

Other Formax products include the well-known C-20 Flexible Contact Wheels and F-26 Abrasive Belt Grease Stick.

Descriptive Catalogs Sent on Request

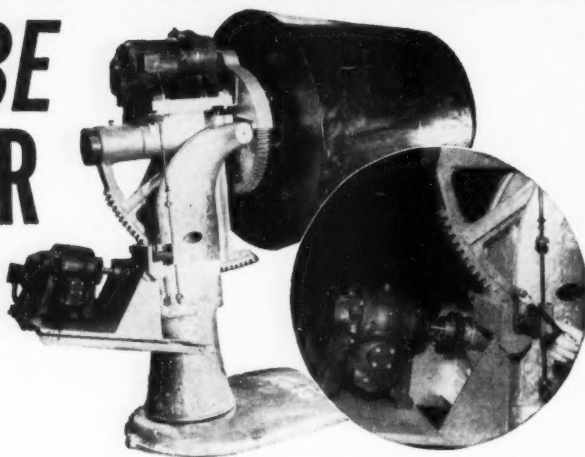
FORMAX MFG. CORP.

DETROIT 7, MICHIGAN

"THE FOUR McALEERS"

Casalbi GIVES YOU

GLOBE POWER TILT



for

safety • economy • convenience

Fingertip tilting brings you the advantages of faster tumbling cycles, reduced operator fatigue and savings of floor space in your finishing department. Globe's new tilting mechanism enables your operator to quickly move the barrel to pre-selected or manually selected operating position by means of a simple, 3-position reversing control.

what's your finishing problem?

Let CASALBI's experimental engineering service analyze your parts finish needs. Send samples of parts and completed piece to show desired finish. CASALBI will provide detailed cost-saving finishing recommendations. Write today! No obligation, of course.

Write Dept. 44 for Tumbling Barrel Bulletin C-1

Casalbi Company

WEST GANSON & WAYNE • JACKSON MICHIGAN

GLOBE tumbling barrels have been serving industry since 1902

dale. Moving operations are scheduled for the first of the year.

Rhodes Purchases National Buff Co.

James H. Rhodes & Co., Chicago, Ill. and Long Island City, N. Y. announce the purchase of the principal assets and manufacturing facilities along with patent rights to air-cooled bias buffs of the *National Buff Co.*, New York, N. Y. and Hawthorne, N. J.

Change in S. A. Day Management

Management of the *S. A. Day Mfg. Co.* changed February 1, 1955, after 43 years of continuous operation by the Day family. It was originally founded by *Stanley A. Day* in 1912,



J. L. Martin



F. N. Baldwin

and continued successfully by his son, *Harold A. Day* since 1944. The present officers and directors are as follows:

- J. L. Martin*, president.
- E. B. Wilson*, Vice-President.
- J. H. Bowling*, Secretary.
- F. H. Baldwin*, Treasurer.

Mr. Baldwin will also serve as general manager for the firm, which manufactures buffs, buffing compounds, and polishing wheels, and acts as a distributor of a complete line of plating chemicals, supplies, and equipment.

For the last seven years, Mr. Baldwin was associated with The Ethyl Corp., serving in its Detroit research laboratories and on the product development staff in New York. From 1947-1949 he was associated with Shell Chemical Co. in Houston, Tex.

A native of Albany, N. Y., Mr. Baldwin received an AB degree from Hobart College, Geneva, New York in 1942 and an M.S. degree in organic chemistry from Cornell University in 1947. During World War II, he served as an officer and research chemist at the Naval Research Laboratories in Washington, D. C.

Mr. Baldwin brings to the firm an intimate knowledge of chemical products and processes as well as marketing experience. He is a member of the American Chemical Society, American Oil Chemist Society and the Chemical Market Research Association.

Pope Assigned to Pennsalt's Cleveland Territory

Alfred H. Pope of the administrative staff of the *Pennsylvania Salt Mfg. Co.*'s Metal Processing Chemicals Department has been named sales rep-



Alfred H. Pope

representative in Cleveland. He will succeed *James Keers* who was recently transferred to Detroit.

Mr. Pope, a graduate of Pratt Institute, has been associated with Pennsalt since 1943. For 7 years, he served as a member of the Whitemarsh research staff and assisted in the development of many of the metal processing chemicals now included in his product line. Later, while assigned to the technical service staff, he gained additional specialized experience in the metal processing chemicals field.

Dalic Appoints Marlane as U. S. Distributor

Dalic Metachemical, Ltd. of Toronto, Canada, announces the appointment of the *Marlane Development Co.* of 153 E. 26th St., New York City, as a distributor for the Dalic process of selective localized electroplating.

Marlane, a consulting firm specializing in the development of modern processes for plating and engineering industries, will be completely responsible for all inquiries and technical servicing of the process.

McFarland Named President of Atlantic Compound

William R. McFarland has been named president and general manager of *Atlantic Compound Co.* of Waterbury, Conn.

Under his direction a program of expanding production facilities is underway to meet the demand for greaseless polishing and buffing compounds in all grades and grit sizes.

Mr. McFarland was for several years with the *Lea Manufacturing*

The only filter on the market you can **LEARN TO OPERATE IN ONE MINUTE!**
CLEAN COMPLETELY IN LESS THAN 15 MINUTES!

Sel-Rex

DOUBLE DUTY FILTERS

Cuts filter cleaning time to less than 15 minutes

No filter on the market can be completely cleaned and reassembled as fast as a Sel-Rex DOUBLE DUTY Filter.

The entire Annular element is secured to the tank cover—lifts out freely and easily for cleaning, either by hand or with the sturdy, hand-operated davit mounted on the tank of larger units. Messy handling of wet and dirty elements is eliminated—you can even clean an element used for carbon treatment without soiling your hands!

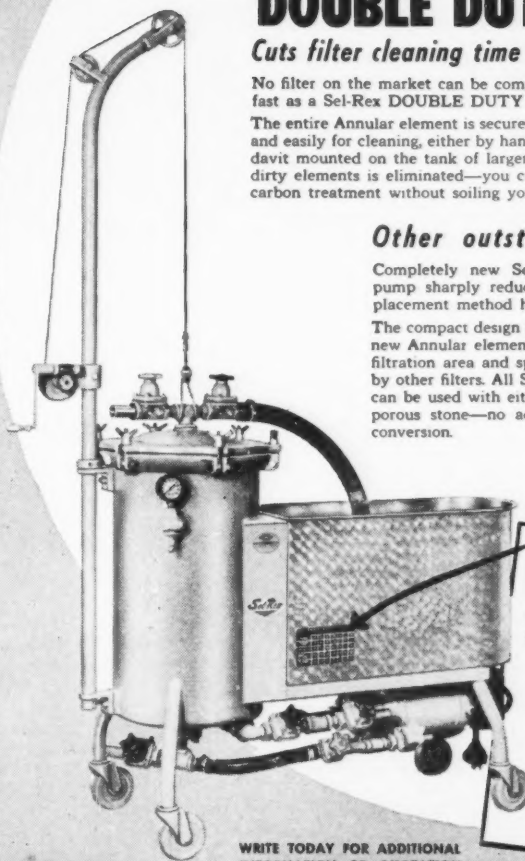
Other outstanding advantages:

Completely new Sel-Rex-designed mechanical seal pump sharply reduces maintenance. Pump seal replacement method has been simplified.

The compact design saves valuable shop space... the new Annular element gives DOUBLE the amount of filtration area and speed in the same space required by other filters. All Sel-Rex DOUBLE DUTY Filters can be used with either the new Annular element or porous stone—no additional parts are required for conversion.

Standard models from 250-18,000 GPH capacity

Larger models built to specification.



WRITE TODAY FOR ADDITIONAL INFORMATION OR QUOTATION

BART-MESSING CORPORATION

229 Main Street, Belleville 9, New Jersey

Newark

Detroit

Los Angeles

So simple to operate —
You can learn to perform ALL filtering operations in less than ONE minute—precoat... filtering... backwashing... or liquid transfer—even if you've never operated a filter before. Simplified, easy-to-read instructions are fastened to the front of the tank—can be read when operating valves are used. Valves are conveniently located, colored and numbered for quick identification.



William R. McFarland

Company in various managerial capacities.

Atlantic is now packaging greaseless compounds in foil lined fiber board containers as well as the standard aluminum tube. This type of packaging is claimed to provide savings to users without effecting the high quality of the compound.

Diversey Names New Division Manager

The appointment of *J. O. Slaybaugh* as division manager of *The Diversey Corporation's* Cleveland Division was recently announced by *W. E. Noyes*, vice-president in charge of sales.

Slaybaugh joined the sales staff in 1941. After serving in the armed

**Micro-ohm Resistance is
uniformly LOW when
Aluminum is Deoxidized
for Spotwelding with NEW,
patented
KELITE PROCESS 822**

KELITE exclusive, patented*
PROCESS 822—a liquid miscible in
water—removes oxides and scale and
prepares aluminum alloys for resist-
ance, spot and seam welding.

Significant advantages: low "pull-
test" mean and standard deviations
on welded specimens; exceptional
"mileage" performance on welding
tips; no volatile or flammable sol-
vents; no toxic or corrosive vapors;
no hexavalent chrome waste dispos-
al problem; 1 to 2-year minimum
bath life.



PROCESS 822 quali-
fies for Class I
Aircraft Welding.

*U.S. Patent No.
2,710,792

KELITE

Write or
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Service Offices in 98 U.S. Cities and 16 Countries Abroad
Plants and Division Offices: Los Angeles, Berkeley Heights, N.J.,
Chicago, Dallas, Mexico City, Toronto

forces during World War II, he re-
turned to the company as a field repre-
sentative. Successive promotions to
district manager in 1951 and assist-
ant division manager in 1954 led to
this new assignment.

Engelberg Huller Names Whitt

Earl B. Whitt has been named sales
engineer in the mid-Atlantic territory
for the Engelberg Huller Co., Inc.,
Syracuse, N. Y., manufacturers of
abrasive belt machinery.

Mr. Whitt will make his headquar-
ters at 41 Burnet St., New Brunswick,
N. J. His new territory will include
Maryland, Delaware, New Jersey,
eastern Pennsylvania, and metropol-
itan New York City. A native of Syra-
cuse, N. Y., Mr. Whitt attended tech-

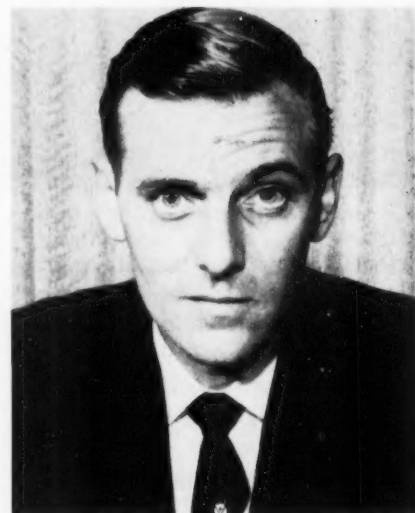


Earl B. Whitt

nical school there and was a member
of the methods engineering staff of
the Porter Cable Machine Co. before
joining Engelberg Huller.

During World War II, he served in
the U. S. Army in the European theater
for four years.

Wagner Brothers Appoints New Director of Purchases and Inventory



William W. Watson

William W. Watson has been named
director of purchases, inventory and
budget control of Wagner Brothers
Equip. Co., announces Joseph R. Wag-
ner, president.

Prior to joining this firm, Watson
was a buyer for the Garland Mfg. Co.,
from 1946-1955.

Manderscheid at New Location

The Manderscheid Co., manufactur-
ers of metal finishing supplies and
equipment, announces that it has
moved to more modern quarters at
210 So. Clinton St., Chicago 6, Ill.
The new telephone number is State
2-8662.

Battelle Chemical Polishing Patent Upheld

A consent decree was entered on
August 1, 1955, in federal court in
New York in favor of The Battelle De-
velopment Corp. for infringement of
its chemical polishing patent No.
2,446,060. The defendant was the
Harstan Chemical Corp. Battelle's li-
censee in the New York area, The
Enequist Chem. Co., Inc., was a joint
plaintiff with Battelle.

As a result of this decree, Harstan
will cease to market its Shinol 6 chem-

ical polishing composition and will destroy its present stock. In a separate stipulation Harstan also stated that it did not contest the validity of the patent.

Infilco Promotes Kominek

Edward G. Kominek has been promoted to the position of general sales manager of *Infilco, Inc.*, manufacturer of equipment for the treatment, hand-



Edward G. Kominek

ling and measurement of liquids. In his new position Mr. Kominek will have general supervision of all sales representatives in the country, as well as for *Infilco Canada*, *Infilco Mexicana* and offices in other foreign countries. His headquarters will be at the main office in Tucson, Ariz.

Mr. Kominek has been assistant sales manager since 1950, and is a member of A. I. Ch. E., ASTM, ACS and TAPPI. He has written many articles for numerous publications on the treatment of liquids and their disposal and has contributed important patents to the company.

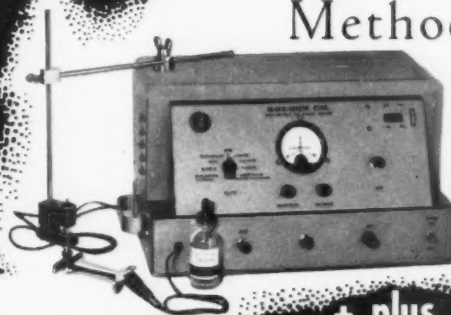
Mr. Kominek has been with the company since 1937 when he joined it as a research chemist with the exception of a brief leave of absence in 1944-'45 when he was loaned to the *Houdaille-Hershey Co.* to supervise their atomic energy plant at Decatur, Ill.

Ivins Named to H-VW-M Electrical Sales Post

Clinton F. Ivins, Jr., has been appointed assistant manager of electrical sales at *Hanson-Van Winkle-Munning Co.* He will be particularly concerned with the marketing of low voltage rectifiers and will have general re-

Check plating thickness

WITH THE
**KOCOUR
ELECTRONIC
THICKNESS
TESTER***



*Anodic
Solution
Method

6 Simple steps . . .
to quick, accurate results

+ plus
these features

1.



MOUNT THE CELL . . . on the spot to be tested and clip lead wire to specimen.

2.



ADD TEST SOLUTION . . . which corresponds to the type of plating and base metal tested.

3.



PLACE STIRRER IN POSITION.

4.



SET SELECTOR SWITCH to the type of plating to be tested as indicated on panel.

5.



PRESS THE TEST BUTTON to start the test . . . and upon completion the unit shuts off automatically.

6.



TAKE THE READING directly from the counter on panel i.e., 0.00041".

TOTAL TIME . . . less than 2 minutes

KOCOUR CO.

Pioneers in Control for the Plating Industry

- DETERMINE THICKNESS OF decorative chromium heavy chromium silver tin cadmium zinc lead-tin alloy tin zinc alloy on various base metals and materials.
- WIDE THICKNESS RANGE
- DIRECT READINGS
- 90-95% ACCURACY
- TESTS ARE RAPID
- VIRTUALLY AUTOMATIC
- ELIMINATES HUMAN ELEMENT

Don't delay! See how the Electronic Thickness Tester can solve your problem. Write for literature today.

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CHICAGO 32, ILL.



Clinton F. Ivins, Jr.

sponsibilities in the entire electrical sales program, under electrical sales manager *P. Ross Lyons*.

Prior to joining H-VW-M at the end of last year as an electrical sales engineer, Ivins was associated with the *Keuffel & Esser Co.* as an assistant to the vice-president. Before that he was with the *Public Service Electric & Gas Co.* of New Jersey as an industrial power sales engineer.

Ivins received his B.S. in engineering at Princeton in 1943 and did graduate work in electrical engineering at Harvard and M.I.T. After the war he attended the Graduate School of Business Administration at New York University. He is a member of the American Institute of Electrical Engineers

new THERM-X

QUARTZ IMMERSION HEATER

FOR RUGGED DEPENDABILITY

Here is an immersion heater with all of the plus features. Constructed with a pure fused quartz shell, it is chemically inert from practically all solvents.

The "THERM-X" heater is available in lengths from 10" to 72", from 100 to 10,000 watts and 115, 230 and 440 volts. Heater supports and protection tubes are also available. Put these newly developed heaters to work for you and be SURE you are using the finest.

"SNAP-ACTION" QUARTZ THERMOSTAT
For Control of Corrosive
Liquids and Gases

An outstanding development in heat control. Immune to chemical attack but extremely sensitive to temperature. Finger tip control by adjusting simple dial.

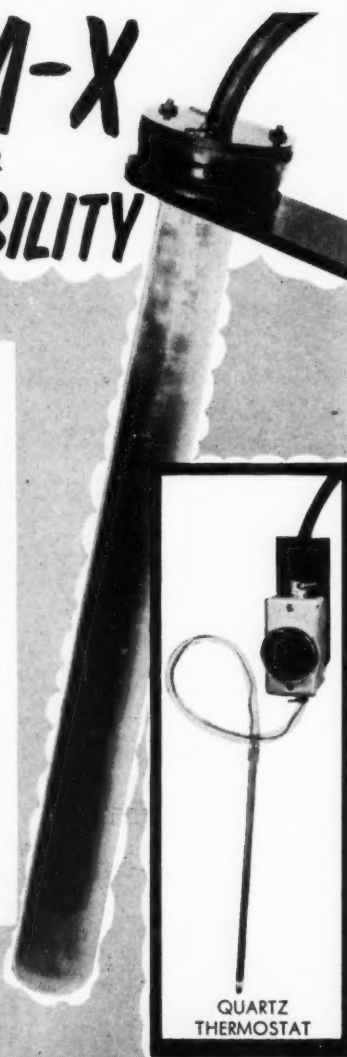
RATING: 22 Amperes at 120-240 volts.
Capillary tubing length 36"

Send today for descriptive literature.

Manufacturers of a complete line of immersion heaters.

N. J. THERMEX COMPANY, INC.

535 BERGEN STREET, HARRISON, N. J.



J. A. Cairns

Baltimore home office as manager of special projects. In his new capacity as sales manager, Mr. Cairns will have jurisdiction over the company's direct sales districts as well as the distributor organization and the warehouse network. He will report directly to Mr. Kingsbury.

Prior to joining Allied, Mr. Cairns had acquired 12 years of production plating experience at the General Electric Co. in Philadelphia, as well as at the Ronson Lighter Co. He had also been a finishing specifications engineer at R.C.A., Camden, N. J.

Mr. Cairns holds a degree in chemical engineering from the Drexel Institute of Technology and is a member of the American Electroplaters' Society and the American Society for Metals.

U. S. Hoffman Appoints Wallace

Charles A. Wallace has been appointed manager of the *Industrial Filtration Division* of the *United States Hoffman Machinery Corp.*, according to announcement by *Revis L. Stephenson*, vice-president.

Formerly assistant division manager, Wallace has been with the company 24 years. He previously had been a machine tool engineer and before that an automotive engineer. He is a graduate of the Massachusetts Institute of Technology.

Stauffer Names Haslanger

The appointment of *Robert U. Haslanger* as director of industrial sales, *Stauffer Chemical Company*, was announced recently. Mr. Haslanger, who will continue to make his headquarters

and the American Society of Mechanical Engineers.

Klem Opens West Coast Plant

T. Curtis McKenzie, president of *Klem Chemicals, Inc.*, Dearborn, Mich., announces the opening of *Klem Chemicals, Inc.* of California, located at 1905 North Central Ave., El Monte, Cal. and the appointment of *Jack Borkman* as general manager.

The new plant is fully equipped to handle all West Coast production of both liquid and powder metal cleaning, rust removing, phosphate coatings, paint removing and spray booth compounds. It also has complete laboratory facilities for maintaining service on all commercial problems.

Mr. Borkman has been established for many years in the metal cleaning field on the West Coast and is associated with Mr. McKenzie in this new plant.

Allied Appoints Cairns Sales Manager

J. A. Cairns has been appointed sales manager of *Allied Research Sales Corp.*, Baltimore, Md., effective September 1, it has been announced by *L. C. Kingsbury*, vice-president in charge of sales.

Mr. Cairns joined the organization in 1948 and in 1951 was made district sales manager for the eastern Pennsylvania-northern New Jersey territory. In 1954, he was brought into the



Robert U. Haslanger

in New York City, had been Eastern sales manager. The appointment fills the vacancy created by the death, some months ago, of *T. A. Haschke*.

Stearns New Export Officer for Dow

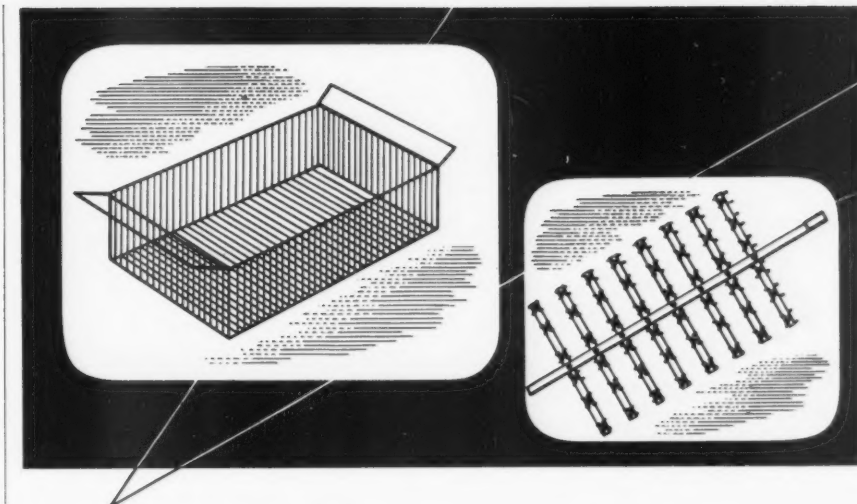
Jack C. H. Stearns, in an executive position with the Dow export companies for the past year and a member of the export board of directors, has been elected to the newly created office of executive vice-president of *Dow Chemical International Ltd.* and *Dow Chemical Inter-American Ltd.*, it is announced by *Clayton S. Shoemaker*, president of the export companies.

Stearns started with the company in 1937, handling general magnesium sales in the Middle West until 1939. For the next five years he served as assistant to the magnesium sales manager and in 1944 became manager of ingot sales. He was appointed to an executive position with the export companies in July 1954 and elected to the export board of directors in December of the same year.

Diamond Alkali Announces Personnel Changes

Five assignment changes in the field sales and service organization of *Diamond Alkali Co.* have been announced at its national headquarters by *W. H. McConnell*, vice-president-sales.

Robert R. Wood, a member of the New York sales staff since January, 1949, has been promoted to the position of special staff assistant in the sales department at Cleveland, effective approximately September 1, 1955. His



PLATING EQUIPMENT STANDS UP LONGEST... with a COATING OF STANLEY CUSTOM PLASTISOL

Racks and other containers handle work with care if they're coated with one of Stanley's complete line of plastisols. High resistance to most chemicals plus a slick surface for fast drain-off and minimum carry-over add up to surface protection that lasts. If your operation uses trichlorethylene or perchlorethylene, specify Stanley 77X-1078 orange plastisol. Write for

details to Stanley Chemical, 81 Berlin St., East Berlin, Conn.
Midwest representative: *Russ-Howell Agency*, Detroit and Grand Rapids.

Ask for FREE Bulletins on Stanley plating rack coatings.



STANLEY CHEMICAL

**LACQUERS
SYNTHETICS
VINYL
ENAMELS**

successor at New York is *C. Robert Powell*, who has been transferred from Cincinnati, where he is being succeeded by *Charles H. Gillespie* as sales representative in the Louisville area. *Charles B. Kayser*, on the Cincinnati sales staff since May, 1948, will now represent the company at Columbus, with headquarters at Columbus, Ohio.

Louis P. Lambros, formerly of the central order department at Cleveland, has been named to succeed Mr. Kayser in Cincinnati. These last four changes are effective immediately.

Wood, a native of Fair Lawn, New Jersey, joined the company following graduation in 1948 with an A.B. degree in chemistry from New York University, College of Arts and Sciences.

He also pursued engineering studies at the New York College of Engineering and Pratt Institute. He is a World War II veteran, having served as an officer in the U. S. Army Chemical Warfare Service for four years.

Born in Scranton, Pennsylvania, Powell is a chemical engineering graduate (1950) of Pennsylvania State University. He has been affiliated with the company at Cincinnati since 1951.

Gillespie, a native of Fairport Harbor, Ohio, earned an A.B. degree from Colgate University in 1949, then joined Diamond as a chemist, and was later transferred to Cincinnati in a sales capacity. A Marine Corps veteran, he is a member of Alpha Tau Omega and the Veterans of Foreign Wars.

Kayser, born in Cincinnati, Ohio,

attended the University of Cincinnati, where he was awarded his B.S. degree in Commerce in 1952. A World War II veteran, his professional affiliations include membership in the American Electroplaters Society, the Water Works Association, Industrial Waste Association, and the Cincinnati Paint and Varnish Association.

Lambros, a native of Lakewood, Ohio, joined the company in September, 1954, as a staff assistant in the central order department.

United Chromium Honors Stareck

A dinner was held recently in New York to honor Dr. J. E. Stareck upon his completion of 20 years service with *United Chromium*. Dr. Stareck was presented with a gold watch by R. O. Loengard, vice-president of *Metal & Thermit Corp.*

Dr. Stareck has held the position of director of research with *United Chromium* since 1941 and, when the company became a division of *Metal & Thermit* in May of this year he was made director of research for the parent company.



Dr. J. E. Stareck (left) Director of Research of *Metal & Thermit Corporation* is presented with a gold watch on the occasion of his 20th anniversary with the company, by R. O. Loengard, Vice-President.

Dr. Stareck attended the University of Kansas where he received his M.A. in 1930. While working on the thesis for his doctorate he discovered the process of color plating now known as *Electrocolor*. In 1933 he was awarded the Roy Cross Research Fellowship to further his studies of color plating. Dr. Stareck received his Ph.D. in chemistry in 1934 and, in 1935, joined

United Chromium in the research laboratory. He continued his research on *Electrocolor* and shortly developed the related process of electrodepositing patterns known as *Patternplate*. In 1939 he was awarded the Edward Longstreth Medal for these contributions in the field of coloring metals.

Other processes developed under his direction in recent years are copper plating from pyrophosphate solutions, high speed chromium plating, and crack-free chromium.

Simplex Appoints New Sales Engineer

The *Simplex Valve & Meter Co.*, with headquarters at 7 East Orange St., Lancaster, Pa., announces the appointment of *Hugh J. McNelis* as sales engineer for their Chicago, Ill., office. He came to the firm in January 1952 as a service engineer for their Philadelphia, Pa., office.

Working in conjunction with *A. F. Barron*, sales representative, his territory will include Northern Illinois, Northern Indiana and Western Michigan.

THE ANSWER TO YOUR TANK HEATING PROBLEMS

FOR ACID HEATING JOBS



G SERIES FUSED QUARTZ IMMERSION HEATERS

Over 40,000 CLEPCO Fused Quartz Heaters now in service.

Dependable, controlled heat at low operating cost.

Wide range of Standard Sizes for every need.

Only Fused Quartz Heater recommended and sold by all leading plating supply houses.

FOR ALKALINE HEATING JOBS



W & WS SERIES STEEL AND STAINLESS IMMERSION HEATERS

Specify CLEPCO Non-Magnetic Stainless Steel Heaters for your alkaline electro cleaners and bright copper plating tanks.

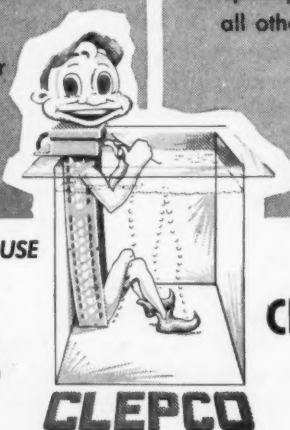
Specify, CLEPCO Steel Heaters for all other alkaline tanks.

All leading Plating Supply Houses can furnish from stock.

SEE YOUR PLATING SUPPLY HOUSE

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Cleeco



CLEVELAND PROCESS COMPANY

1965 EAST 57th STREET
CLEVELAND 3, OHIO

McKeown Appointed Manager, Cochrane Philadelphia District Sales Office

Cochrane Corporation, Philadelphia, manufacturers of water conditioning equipment, steam specialties, and condensate return systems, recently announced the appointment of *M. C. McKeown* as manager of the Philadelphia district sales office.

Mr. McKeown was technical director of the Water Treating Division of the firm and manager of technical training. He is the author of numerous papers on water conditioning and has often lectured on the subject. His background will serve as an invaluable aid in solving complex problems in water treatment in the Philadelphia area.

Ronca Elected Chairman of Technical Committee of Abrasive Grain Assn.

F. Paul Ronca, manager of the silicon carbide product engineering department of *The Carborundum Co.* was elected chairman of the Technical



F. Paul Ronca

Committee of the *Abrasive Grain Association*.

The function of the Committee is to set up and standardize grain size and related technical specifications having to do with the manufacture of abrasive grain. This Committee works with the United States Bureau of Standards as the representative of

the eleven manufacturers and processors that make up the association.

A graduate of Worcester Polytechnic Institute, Mr. Ronca has been associated with the production of abrasive grain at *The Carborundum Co.* for thirty-one years. He is a member of the American Chemical Society, the National Association of Foremen, and the American Society of Quality Control.

A native of Barre, Vermont, Mr. Ronca now lives in Niagara Falls, N. Y., where he makes a home for his wife and two children.

Oakite Appoints Phoenix Representative

Oakite Products, Inc., manufacturers of industrial cleaning and metal treating materials, have announced the appointment of *John C. Mullarkey* as the company's technical service representative in Phoenix, Ariz. Mr. Mullarkey, formerly a contractor in Southern California, recently completed an intensive training course at the company's New York headquarters and in the field.

DAVIS-K GOLD PLATING SOLUTIONS

ALL DAVIS-K Gold Plating Solutions Are:

- Made in all colors
- Color-constant
- Tarnish-Resistant
- Brilliant in Finish
- Bottled by Troy weight
- Made from assayed US Treasury Gold only
- Ready for immediate use

NOW AVAILABLE — Variable-type Tank Rheostats . . . specifically designed for precious metal plating.

New!

• **HARD GOLD SOLUTION** — Davis-K Research has developed this NEW Hard Gold Solution specifically for printed circuits and electronic parts. This amazing new product cuts Gold Deposit 50%, has maximum resistance to contact and abrasion, and has high throwing power. There are no control problems and it plates at low temperature. *Small samples will be plated at no charge.*

- ... Will Save You Time!
- ... Will Save You Money!
- ... Are Unconditionally Guaranteed!

Davis-K, through constant research and quality control methods, has consistently maintained its position as a leader in the metal plating field.

ONE OPERATION

Antique Gold Solution

- POTASSIUM GOLD CYANIDE SALTS
- LUSTROUS WHITE RHODIUM SOLUTION

We are fully equipped to reclaim old gold and rhodium solutions.

"Where Glittering Elegance Reflects Lasting Quality."



DAVIS-K
PRODUCTS, CO.
135 West 29th St., New York 1, N. Y.
LOngacre 4-1978-9

Van der Horst to Establish Facilities in Chicago

Dr. Hendrik van der Horst, president of the *Van der Horst Corp.*, has announced that the corporation will establish plant facilities in Chicago. The company has purchased the industrial property located at 2610 South Shields Ave., Chicago, consisting of 37,000 sq. ft. of manufacturing facilities and 15,000 sq. ft. of yard



Dr. Hendrik Van der Horst

space. The plant location is served by the Canal Street team tracks.

The company, one of the world's largest heavy industrial electroplating organizations, has additional plants in Olean and Salamanca, New York; Terrell, Texas; Hilversum and Zwolle, Holland.

Initial installations at the Chicago plant will provide for a 48,000 ampere plating capacity. The new plant is expected to be in production early in 1956.

D. R. Glover is Named Sales Representative

Dixie Solvents & Chemicals Co. of Louisville Ky. has announced that D. R. Glover has joined the firm as a sales representative.

Glover formerly was personnel manager for Philip Morris before resigning in 1954 to enter the sales field. He is a University of Louisville graduate and he is currently a director of the Louisville junior chamber of commerce.

Dixie Solvents & Chemicals opened a plant in Shively in 1954 and markets industrial chemicals. It is one of seventeen plants operating throughout the

midwest and south and is affiliated with the Solvents & Chemicals Group.

Pennsalt Establishes New District Sales Territory

Cincinnati has been selected as headquarters of a new district sales territory for the Metal Processing Chemicals Dept. of the *Pennsylvania Salt Mfg. Co.*

Directed by district sales manager



Frank Wilcher

★ **BUFFING NU SPRA GLU**
Liquid buffing compound
since 1945

★ **NUGLU**
Cold flexible glue
since 1937

★ **BRUSHING NUGLU**
Grain and Nuglu mixture
since 1941

★ **SPRAY BUFFING EQUIPMENT**
Guns, pumps, and valves
since 1945

J. J. *Siefen* CO.

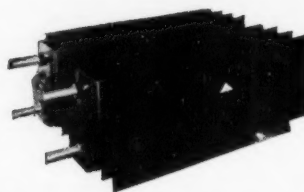
5643 LAUDERDALE • DETROIT 9, MICH.

BUY *Lektron*
RECTIFIER

For the Finest in
**PLATING
RECTIFIERS**

**A BETTER SOURCE OF DC POWER —
MORE FOR YOUR MONEY**

★ Operate from —40° to 225° F.
★ 50 to 50,000 Amperes DC
★ Built-in Voltage Regulator and Meters
★ Heavy Duty Transformers, Husky Fans
Two styles available—1. Selenium for cool zones, or 2. Magnesium copper sulphide for the hot, dirty jobs. Units still running after 4 years of constant duty.



Replacement Rectifier Stacks
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Magnesium copper sulphide rectifiers make your plating power supply more rugged and dependable. Magnesium radiator fins for fast heat dissipation and lighter weight. Matching pairs.

SOME JOBBERS AND SALES TERRITORIES OPEN



Model 4045—750 amps at 12 volts DC—1500 amps. at 6 volts DC. Operates on 200, 220 or 440 A.C. Weight 525 lbs. F.O.B. Indianapolis, Indiana.

ELECTRONIC RECTIFIERS, INC.

2102 SPANN AVENUE

INDIANAPOLIS 3, INDIANA

Bill Wilson, the staff will include sales representatives Jack Cram, Frank Wilcher and Clay Brahm, and technical services representative Allan Lenio.

Kleppinger New V-P of General Ceramics' Chemical Equipment Division

W. D. Kleppinger, formerly general manager of the Chemical Equipment



W. D. Kleppinger

Division, has been elected vice-president of this division by the General Ceramics Corp., it was announced by Henry Arnhold, President.

Mr. Kleppinger will continue to make his headquarters in the general offices and main plant at Keasbey, N. J.

Permutit Promotes Production Personnel

The Permutit Co., New York, manufacturers of ion exchangers and water conditioning equipment for commercial and industrial applications, has announced the promotions of H. M. Appleton and H. Plymire, according to George N. Proctor, vice-president.

Mr. Appleton has been appointed assistant plant manager of the Lancaster, Pa. manufacturing division. He will have as his direct responsibilities the office staff, production control, industrial engineering and personnel.

Mr. Plymire has been appointed to the position of plant superintendent and will be responsible for all machining and assembly operations of Permutit and Simplex Valve & Meter Company apparatus, as well as the maintenance of equipment, plant and property.

Another move was made recently to round out the ARco list of manufacturing facilities and industrial services with the establishment of a new subsidiary, ARco Steel Fabricators, Inc. Heading the new company is R. A.

ARco Steel Fabricators, Inc. Established in Detroit

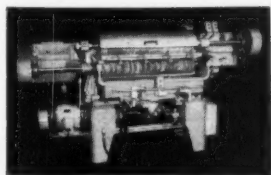
Heading the new company is R. A.



R. A. Jackson

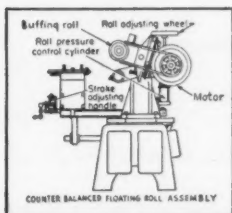


The CLAIR model 202, or one of seven other basic Clair models may well be the answer. Model 202 employs the same fundamental features so outstandingly characteristic of all CLAIR machines . . . Direct line actuation . . . Hydraulic and Air cylinder controls . . . Sealed Anti-Friction bearings . . . Interchangeable parts, etc.



MODEL 202 double roll assures uniform and simultaneous coverage of both sides at any pre-determined buffing pressure, over flat or contoured surfaces. "It Floats On Air".

- Horizontal Design offers . . .
- ★ Waist high loading -- less operator fatigue!
- ★ Better Visibility!
- ★ Rolls can be changed in two minutes!
- ★ Easier to exhaust and keep clean!

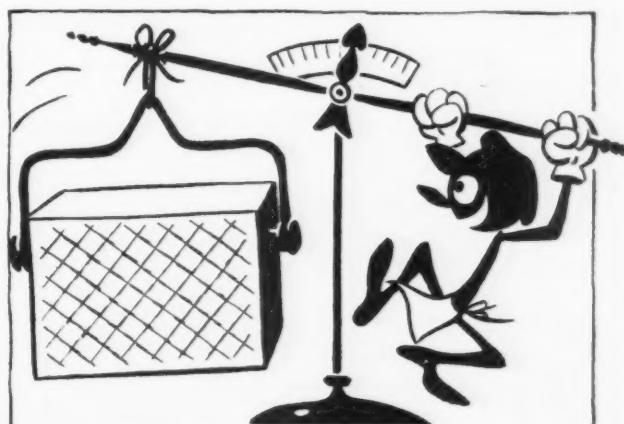


COUNTER BALANCED FLOATING ROLL ASSEMBLY

CLAIR

MANUFACTURING CO., Inc., OLEAN, N.Y.

Offering the Most VERSATILE Line of Surface Finishing Machines



Pickling Pete Sure as fate Picks Monel For lighter weight

What makes Monel lighter? High strength (thin sections handle big loads) plus Monel's acid resistance (less corrosion allowance). Easy-to-repair Monel gives long life, too. Free booklet, "5-Way Savings in Pickling," is worth writing for today.

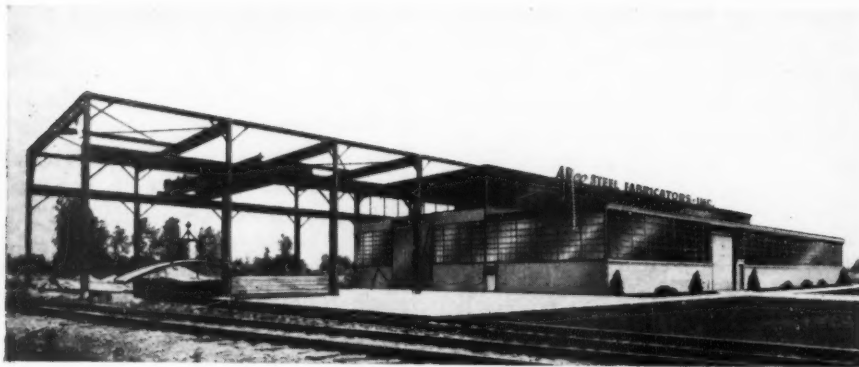
THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.



extra life
extra capacity
extra safety



Monel Pickling Equipment



"Jack" Jackson, general manager, a well-known personality in Detroit and Cleveland structural steel and fabrication circles.

The new firm will specialize in design, fabrication, assembly, construction, and installation of processing equipment for every phase of industry. In many respects, this subsidiary will complement *Automotive Rubber Company's* rubber processing operations by furnishing the latter with tanks, vessels, pipe, fittings, and a variety of fabricated equipment for the application of corrosion-resistant rubber and plastic coatings and linings.

Recently built and equipped, the

new plant is located on property adjoining the parent company's general offices, laboratories, and lining plant at 12550 Beech Road, Detroit.

United Chromium Adds Warehousing Facilities in Mid-West

To provide quicker, more convenient service to customers in the Chicago territory, *United Chromium Division of Metal & Thermit Corp.* has established warehousing facilities at 415 East 151 St., East Chicago, Ind., it was announced by *Henry Mahlstedt*, divisional sales manager.

The Chicago sales office, now located at 208 S. LaSalle St., has also been moved to East Chicago. The warehouse and sales office will be integrated with the parent company facilities at East Chicago. *Willard Carter*, sales manager of the Chicago office, will head up the *United Chromium* operation there.

Rampe Appoints Southern California Representative

Rampe Mfg. Co., 14915 Woodworth Ave., Cleveland, Ohio, have recently appointed *Mido Products*, Torrance, Calif. as Southern California representative for their line of small and medium sized tumbling units.

Metal Parts Sales Company Launched

Metal Parts Sales Co. has been newly organized to handle the sale of tumbling barrels developed by the *Metal Parts Finishing Co.* They are located at 66 Chapel St., Newark 5, N. J.

The associates in this firm are *Steve Yacus* and *A. F. Vonder Linden*.

Looking for a BETTER FINISH?



TAILOR-MADE BUFFING AND POLISHING COMPOUNDS

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Carbon Steel, etc.

CAKE, DIP AND SPRAY CEMENT AND THINNER

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301 N. Market St. • PROspect 5423 • Dallas 1
813 W. 17th St. • BALtimore 2128 • Kansas City 8

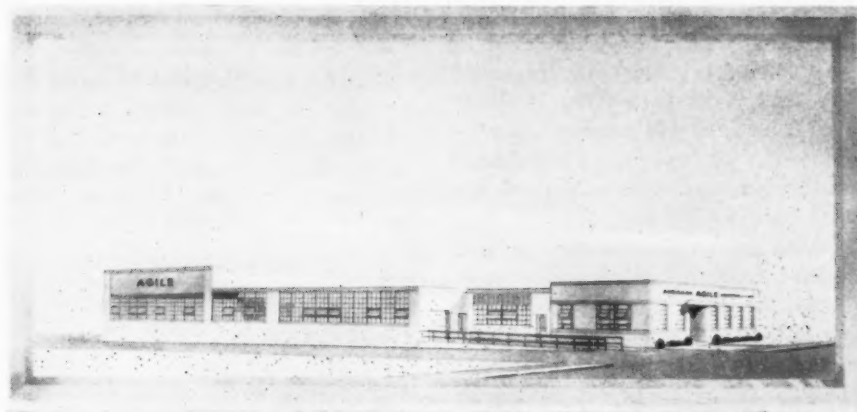
D. B. Gooch Associates to Represent Vanton Pump in Southeast

The appointment of *D. B. Gooch Associates*, Birmingham, Ala., as representatives for *Vanton Pump & Equipment Corp.* was announced by sales manager *Gerald Lewis*. The territory to be covered by exclusive representation includes Mississippi, Alabama, Tennessee, Florida and Georgia.

D. B. Gooch Associates, whose personnel are all chemical or mechanical engineers with extensive experience in the chemical and allied process industries, is well equipped to service the manufacturer's pump installations. Since the design of the pump is such that it is used primarily for the handling of corrosive or hazardous liquids, the broad processing background of the new representatives is expected to provide the technical assistance needed to keep up with expanding sales of this unique plastic pump.

American Agile Announces Major Plant Addition

The addition of more than 10,000



square feet of manufacturing and research area to its present facilities, was announced recently by *Dr. J. A. Neumann*, president of the *American Agile Corp.*, 5461 Dunham Road, Maple Heights (Cleveland), Ohio. The new addition, when completed early

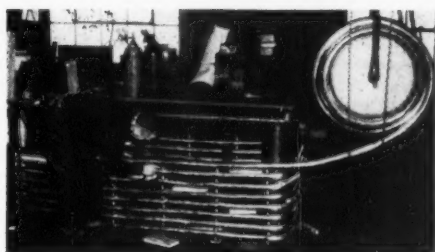
this fall, will nearly double the existing plant facilities.

The present facilities are situated on a 1½ acre site in suburban Cleveland; additional land is still available for another building expansion set for 1958.

Consolidated Engineering Appoints Nunan

J. Kneeland Nunan, president, *Consolidated Vacuum Corp.*, has been named to the newly created post of vice-president and staff advisor to the president of *Consolidated Engineering*

Corp., according to an announcement by *Philip S. Fogg*, president and chairman of the board of the parent company. In his new position, Nunan will act as a special advisor to Fogg on company policy matters relating to management, marketing, and public



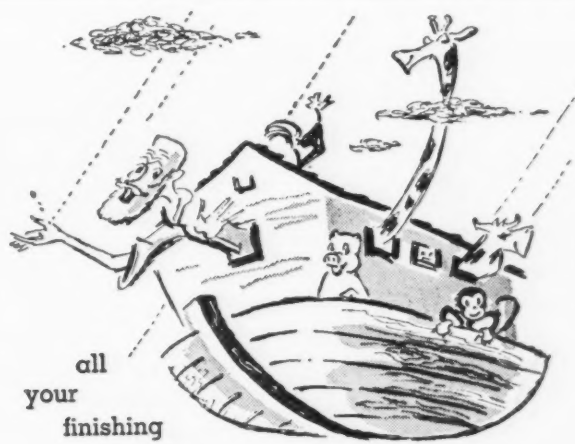
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LONG EXPERIENCE in fabricating coils to fit special requirements — thousands of "different" coils made for heating, cooling, spraying — coils of all shapes — and of all commercial metals — fashioned to order by Storts coilmen for particular customers. This long experience assures correct shaping, structural soundness, efficient performance, complete satisfaction. Let us quote on your special coil needs.



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You can forget about the problems of buying your requirements from numerous sources. Get dependability, complete satisfaction and "one-stop" buying from under our large roof!

Our engineering and technical staff is ready to assist you in solving special problems. We'll be glad to help!

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leaders in finishing equipment for over half a century
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and stockholder relations.

Succeeding Nunan as president of the Rochester, New York, high-vacuum equipment subsidiary is *Hugh F. Colvin*, who will also continue in his present post as vice-president and general manager of Consolidated Engineering.

Nunan joined the company as vice-president in charge of sales in January, 1953, was made executive vice-president of Consolidated Vacuum in March of the same year, and in December, 1954, was named president of the Rochester company.

A former assistant dean of engineering and assistant professor of electrical engineering at the University of Southern California, Nunan was an electrical engineering graduate of USC and subsequently was awarded a master's degree in electrical engineering from the California Institute of Technology.

World War II director of the Pearl Harbor Laboratory, Columbia University Division of War Research, Nunan holds the Medal of Merit for his work on wartime pro-submarine development. He is a member of Tau Beta Pi, Sigma Xi, and Eta Kappa Nu.

Barrett Appoints Canadian Distributor

The *Barrett Chemical Products Co.*, 5 Bridge St., Shelton, Conn. announces the appointment of the *Armalite Co. Ltd.* of Toronto, Can., as the Canadian distributor for their sulfamate nickel plating process.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Plans for the 43rd Annual Convention are already under way. Principal committee chairmen have been appointed for the 1956 conclave in Washington, D. C. Dates of the convention are June 17-21, 1956 with headquarters at the Hotel Statler.

The year 1956 marks the second time in 26 years that the Baltimore-Washington Branch will have played host to a Society annual meeting; the last time was in 1930. Features will include technical sessions with papers by prominent authorities in the fields of electroplating and metal finishing,

a keynote speaker, the traditional ladies' program, business sessions of the Supreme Society, a banquet and many other interesting events.

General chairmen include *Arthur G. Pierdon*, Art Metal Finishing Co., Washington, D. C. and AES Past President *Kenneth M. Huston* of Armco Steel Corp., Baltimore, Md. Other principal committee chairmen are as follows: Educational — *Dr. Abner Brenner*, Nat'l Bureau of Standards; Registration — *Fielding Ogburn*, Nat'l Bureau of Standards; Banquet — *Dr. Vernon A. Lamb*, Nat'l Bureau of Standards; Finance — *Jules Horelick*, Allied Metal Finishing Co.; Plant Visitation — *Vincent J. Hughes*, Hughes Chem. Co.; Transportation — *T. R. Boggess*, Norfolk and Western Railroad; Entertainment — *Wendell P. Barrows*, Naval Gun Factory; Hotel — *Asaf A. Benderly*, Diamond Ordnance Fuse Labs; Outing — *William Metzger, Jr.*, Nat'l Bureau of Standards; Publicity — *Raymond Stricklen, Jr.*; Program — *Carl H. Thiede*, Potomac Electrotrope Co.; Ladies' Program — *Mrs. A. Pierdon*.

Dr. William Blum, Nat'l Bureau of



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TRIPLE ACTION

in fully enclosed cutting barrels

There's a new look in Hartford's Tumbling Barrels...but underneath you get the famous Triple Action Barrel originated by Hartford and unsurpassed for doing a better job ... faster...at lower cost.

Compare these advantages! The Hartford fully enclosed Model 1956 is extremely compact . . . requires less floor space than most enclosed barrels. With Hartford the power unit is on top, where it belongs for long life, cleanliness and ease of maintenance. Barrel is mounted on rugged "A" frame for maximum strength. Streamlined steel enclosure confines splash and contributes to safe operation. Pivoted front guard opens to permit quick, easy loading and unloading . . . plus easy removal of barrel assembly. Standard power unit has four speed gear shift transmission. Literature and prices promptly furnished.



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Standards (retired), is honorary chairman of the convention committee.

Buffalo Branch

The Buffalo Branch held its first meeting of the 1955-56 season in the Markeen Hotel, Friday, Sept. 9, 1955, at which time *William D. Hart*, past-president, presented the charter of the branch to the new president *Dr. A. A. Janis* as token of his office. Visitors present were *C. Gordon Johnson* and *Allen Feder*. *Joseph Ruff* reported that the picnic held July 31, at the Kendall Club grounds on Chautauqua Lake was a success. Over 225 attended. *Carl Humes* was appointed chairman of the Christmas party to be held at the Markeen Hotel Friday, Dec. 2, 1955.

President Janis appointed the following committee chairmen for the Empire State Regional Meeting April 14, 1956 to be held at the Statler Hotel in Buffalo:

Chairman of educational session — *Frank Rudolph*.

Financial - assistant treasurers — *James Money Penny*, *Charles Fotheringham*.

Program — *Boris Joffe*.

Publicity — *John Martin*.

Ladies Chairman — *Mrs. Ruff*, *Mrs. Hart*, *Mrs. Martin*.

The following applications were approved by the Board of Managers and were admitted to membership:

Ralph C. Stemmerich, Clarence, N. Y.

Ralph E. Ludwig, Youngsville, Pa.

D. D. Dalrymple, North Warren, Pa.

R. M. Spencer, Youngsville, Pa.

Allen M. Feder, Buffalo, N. Y.

Paul H. Margulies, Eggertsville, N. Y.

Wm. C. McDonald, Erie, Pa.

H. A. Fudeman was appointed chairman of a committee to revise the branch by-laws.

Frank Rudolph introduced *F. F. Spruance*, assistant sales manager, American Chemical Paint Co., who spoke on the subject: "Preservation and Paint Bonding of Aluminum."

Eric G. Sampson, Jr.,
Secretary

Newark Branch

A course in basic practical electroplating will be sponsored by the New-

ark Branch during the Fall of 1955 in response to an urgent appeal for electroplating instruction by both members and non-members of the Society. The course will consist of eleven weekly sessions meeting for two hours each on successive Tuesday evenings beginning on September 27th and ending on December 6, 1955. Five sessions will be devoted to preparation of the basis metal for plating, four sessions will cover various commonly used plating processes, and two sessions will deal with maintenance and control of plating solutions. The instructors, selected on the basis of their specialization in particular phases of electroplating, will be, for the most part, members of the Branch.

A novel feature of the course is that the meetings will be held at various industrial plants and laboratories in the Newark area so as to combine plant tours with the lectures. The schedule for the 1955 course is shown below. Approximately 40 students have been accepted for the course and certificates will be awarded at the Newark Branch meeting on December 16, 1955 to those students who have

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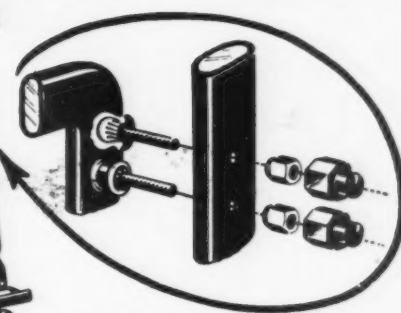
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Available as completely assembled racks or precoated rack members and tips.

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No added investment. Just order Thinker Boys when you buy racks. Instead of ceilings cluttered with no longer needed racks, you'll soon have a supply of Thinker Boy Parts—be able to assemble coated racks of your own design in a matter of minutes. Ask your BELKE Service Engineer or write for details.



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successfully completed the course.
The electroplating course will be

under the chairmanship of *Dr. Dodd*
S. Carr, assistant director of electro-

chemical research, Bart Laboratories
Co., Inc., Belleville 9, N. J.

SCHEDULE OF NEWARK BRANCH, A.E.S. ELECTROPLATING COURSE

Meeting No.	Date	Meeting Place	Subject	Instructor
1	9-27-55	Hy-Grade Plating Co. Newark, N. J.	Introduction to Electroplating	D. S. Carr
2	10- 4-55	Oakite Products, Inc. (Labs.) New York, N. Y.	Racking of Plating Work Metal Cleaning and Pickling	E. Wagner G. A. Lux
3	10-11-55	Hanson-Van Winkle-Munning Co. Matawan, N. J.	Polishing and Buffing	J. Badalucco
4	10-18-55	Metal Finish, Inc. Newark, N. J.	Barrel Finishing	P. E. Kircmartz
5	10-25-55	Oakite Products, Inc. New York, N. Y.	Electrocleaning and Phosphate Coatings	G. A. Lux
6	11- 1-55	Royal Plating & Polishing Co. Newark, N. J.	Copper and Dull Nickel Plating	L. Donroe
7	11- 8-55	Pyrene Metal Finishers, Inc. Newark, N. J.	Bright Nickel and Chromium Plating	L. Donroe
8	11-15-55	Hanson-Van Winkle-Munning Co. Matawan, N. J.	Analysis and Control of Plating Solutions	D. G. Foulke
9	11-22-55	Sel-Rex Precious Metals, Inc. Belleville, N. J.	Precious Metal Plating Solution Analysis	E. C. Rinker
10	11-29-55	Bart-Messing Corporation Belleville, N. J.	Purification and Filtration of Plating Solutions	D. S. Carr M. W. Mitchell
11	12- 6 55	Kosmos Electrofinishing Research, Inc. Belleville, N. J.	Cadmium and Zinc Plating	J. Kosmos

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ONE GALLON TOTAL VOLUME OPEN BARREL

For tumbling small parts in Laboratories, Foundries, Screw Machine Shops, Plating Works, Lapidary Shops and industry in general this new Rampe Mini-Tumbler will equal larger tumblers in speed and quality of work — at a saving in production cost and factory space.

Closed barrel available. Barrels furnished with vinyl plastic lining only. 1/12 H.P. split-phase, 110 volt 60 cycle AC Motor. Net weight 25 pounds.

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This is just one of a line of medium priced, high quality barrel finishers.

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Eliminates heavy metal impurities, including copper.
Prevents harmful build-up of carbonates.

A complete cleansing treatment: — No other purification measures necessary.

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Philadelphia Branch

The annual educational session and banquet of the Philadelphia Branch will be held on November 19 at The Benjamin Franklin Hotel in Philadelphia. The educational session will start at 2 o'clock, the banquet at 7.

Manufacturers' Literature

Air-Cooled Bias Buffs

James H. Rhodes & Co., Dept. MF, 157 W. Hubbard St., Chicago 10, Ill.

The above firm has issued a descriptive catalog entitled "Colossus Air-Cooled Bias Buffs." It is available on request to the company at the above address.

Buffing and Polishing Machines

Automatic Buffing Machine Co., Dept. MF, 222 Chicago St., Buffalo 4, N. Y.

The above firm has issued an illustrated booklet on its automatic and

semi-automatic machines for buffing, polishing, deburring, wire brushing and abrasive belt grinding. Diagrams and specifications of each are included, as well as a description of the machine.

Electroless Nickel Process

Keystone Chromium Corp., Dept. MF, 1095 Niagara St., Buffalo 13, N. Y.

The above firm has issued a twelve page, illustrated booklet on the Kani-gen process, which is a method of depositing uniform, hard, corrosion-resistant nickel-phosphorus coatings on iron, copper or aluminum and their alloys from a chemical bath without the use of electricity.

Among the points covered are the properties, basis materials, surface appearance, applications, design consideration and facilities.

Technical Chart

Frederic B. Stevens, Inc., Dept. MF, Detroit 16, Mich.

A new 3-part utility folder, designed for the metal finishing and plating

department, can be used for three important purposes:

A stock record to help plants check their finishing supplies inventory.

An emergency First Aid wall chart outlining treatment for plating room accidents.

A file folder to file technical bulletins and sales literature supplied by supplier sales engineers.

All future requests for company sales bulletins will be mailed in one of these utility file folders.

Extra copies for inventory and First Aid use are available from company sales engineers or may be obtained by writing the above manufacturer.

Plating Plant Installation

George L. Nankervis Co., Dept. MF, 19255 W. Davison Ave., Detroit 23, Mich.

An illustrated booklet has been issued entitled "World's Largest Plating Plant," which features equipment engineered and installed by the above firm for a large automobile manufacturer.

The size and scope of the operations,

TAKE THE **LOAD**
OFF YOUR **TOP**
BRASS



USE **TRUE BRITE**
BRASS SOLUTIONS

Trouble Free — Low Cost
Little Supervision Needed
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FAST
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FOR METALS ON METALS
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You can have 100% inspection of production of nearly any possible coating on almost any base. The first and only non-destructive tester which gives fast, accurate, direct readings of such combinations as silver on brass, copper on zinc, metallizing on plastics, paint on metals—without the use of chemicals.

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UNIT PROCESS ASSEMBLIES, INC.

Manufacturers of Periodic Reverse Units and
Electronic Equipment for the Plating Industry
75 EAST FOURTH STREET • NEW YORK 3, N. Y.

with custom-designed and built plating machines and huge generators are described.

Buffing & Finishing Compounds

The Globe Compound Co., Inc., Dept. MF, Waterbury-Bristol Road, Waterbury 12, Conn.

Revised technical bulletin T-5 lists and describes both bar and liquid abrasive compositions which have been tested and proven in industrial applications over many years. Particular attention is called to the stainless steel compounds for both cutting and coloring applications and red rouge for coloring non-ferrous metals.

Controls for Waste Treatment

Leeds & Northrup Co., Dept. MF, 4934 Stenton Ave., Philadelphia 44, Pa.

A new process data sheet, 700(2), outlines latest company developments for control of pH and redox in industrial waste treatment processes.

The sheet includes a discussion of "controllability factors" in waste processes that are reported to influence automatic measurement and control of

pH. With it is provided a "pH Controllability Analysis Questionnaire." This may be completed and returned for recommendations of control methods and equipment. The company reports this analytical service is available without obligation.

Selective Plating

Marlane Development Co., Inc., Dept. MF, 153 E. 26th St., New York 10, N. Y.

Reprints are available of articles describing the Dalic process of selective electroplating. These articles, including photographs and tables, give a complete description of the process, including the metallurgical characteristics of the plate, the chemical characteristics of the solution, the equipment needed, the method of operation, and a partial list of major applications.

Plastic Equipment

American Agile Corp., Dept. MF, 5461 Dunham Road, Maple Heights, O.

A new condensed catalogue of plastic welding and spraying equipment, large plastic moldings, weldments and

component parts for welded fabrications, has just been published.

The free literature details the company's seamless ducting, sheets, rods, bars and blocks. Dimensions, thicknesses, inner and outer diameters of pipe and tubing, and weights of the various stock pieces of all four materials are detailed in charts and tables. The literature is fully illustrated. All material is arranged for quick, convenient reference.

Strip-Chart Recorders

The Bristol Co., Dept. MF, Waterbury 20, Conn.

A new bulletin describing the company's line of 6-inch strip-chart recorders for pressure, liquid level, temperature, flow, and mechanical motion has just been released.

The 12-page, two-color bulletin contains installation drawings showing methods of applying the instruments to the different variables, as well as photographs of the various models and their features. The use of the recorder as a receiver for remotely generated signals, either pneumatic or electrical, is also described.

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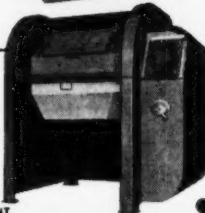
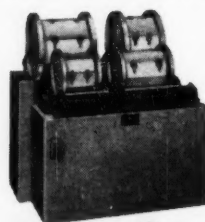
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**I COULD'A SAVED
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The MITY-MITE Line Completely versatile — a unit for every industrial barrel finishing requirement. Ideal for high production on small parts. Also used for short runs or individual barreling of large parts.

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3613-A San Fernando Road, Glendale 4, Calif.

Crack-Free Chromium

United Chromium Div., Metal & Thermit Corp., Dept. MF, 100 East 42nd, St., New York 17, N. Y.

A four-page bulletin, CFC-1, describing the Unichrome crack-free chromium plating process, outlines the advantages of this new process with emphasis on the superior corrosion resistance and buffability of the deposit.

The bulletin is illustrated with comparative cross-sectional and surface views of crack-free chromium and ordinary chromium together with photos of various applications.

In addition to the physical advantages there is also information on the ease of make-up and maintenance of the plating solution.

Automatic Bright Dipping Machine

Frederic B. Stevens, Inc., Dept. MF, Detroit 16, Mich.

Details of an automatic immersion processing machine designed for the bright dipping of aluminum and/or

brass are covered in a selection of trade publication reprints available from the equipment manufacturers.

The articles cover descriptions of two automatic bright dipping operations—one, a small aluminum and brass forging manufacturer and the other, a major manufacturer and user of brass parts.

Labor, acid and space cost savings are detailed. Layouts of the two operations are also included.

Polyvinyl Chloride Fabrications

Haveg Corporation, Dept. MF, 900 Greenbank Road, Wilmington 3, Del.

A new 12-page brochure is now available on fabricated Haveg 1310 (pure, unplasticized optimum chemical resistant PVC).

This brochure gives the latest information on chemical resistance, properties and fabrication procedures. It contains complete specifications, including dimensional charts, on pipe and pipe fittings, fume duct and fittings, dampers, weather caps and valves. It also covers special fabricated items, including fume hoods, self-

supporting rectangular and cylindrical tanks and lined tanks.

Abrasive Blasting

Wheelabrator Corp., Dept. MF, 1150 South Byrkit St., Mishawaka, Ind.

A new bulletin, No. 117-D, on the finishing of stamped metal parts by means of the airless abrasive blasting process contains four case histories of various companies, giving performance data and showing photographs of the equipment they use for this work.

Industrial pH Guide

Beckman Div., Beckman Instruments, Inc., Dept. MF, Fullerton, Cal.

Users of industrial pH instrumentation will find it much simpler to match components such as meters, flow or immersion assemblies, electrodes and manual or automatic electrode switches with the new Industrial pH Buyer's Guide now available.

The four-page illustrated guide, Bulletin 425, shows pictorially which components replace older units and

Whatever your D.C. requirement....

THERE IS A



Feature by feature, Ther Plating Rectifiers are job-rated to give you the most in D.C. power for your operation.

Conservatively rated premium quality selenium stacks deliver D.C. at peak efficiency to cut production time to a minimum and save on power costs.

Arc-eliminating voltage controls protect and lengthen service life of components and equipment.

Copper conductors and bus bars are used throughout to provide maximum conductance and resistance to corrosion.

Fully enclosed ball-bearing fan motors are incorporated in all units.

Vacuum cooling, proven in practice as the most effective means of producing uniform air distribution.

Models are available as either 5% or 18% ripple depending on which is most suited to your operation.

RESULT: HIGH EFFICIENCY, LONG LIFE AND TROUBLE-FREE OPERATION.

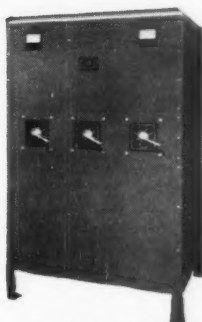
Ther Rectifiers for plating or anodizing are available in a complete line in sizes ranging from 6 to 50 v. at from 25 to 30,000 amps, with self-contained or remote controls; either manual or automatic.

Contact Ther for your specific needs in plating power. Request new Bulletin 5500, containing important data on rectifier arrangements and valuable installation hints.

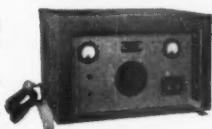


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Ther 12 v., 5000 amp. Self-Contained Rectifier.



Ther also manufactures Bench Model Rectifiers. All models are drip-proof in construction, convection cooled and complete with stepless variable voltage control. Sizes range from 25 to 250 amps. 6 v., 150 amps. unit shown.



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Industry's Abrasive

**BONDING CEMENT
for Wheels and Belts**

SIZES AS WELL AS BONDS

Gripmaster cuts out one preparation material and one preparation step. No special sizing is necessary. This superior bonding cement has a double use. But seein' is believin'. Test Gripmaster in your own plant under your own working conditions. Send us the enclosed coupon or use your company stationery and we'll send you a test size sample without charge or obligation.

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Detroit 27, Mich.

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☐ Please send us literature giving full details.

Name _____ Title _____

Company _____

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how older and newer components can be used together. It also includes a cross-reference chart to simplify electrode selection and tells exactly how to order pH equipment.

Electroplating Systems

George L. Nankervis Co., Dept. MF, 19255 W. Davison Ave., Detroit 23, Mich.

The above firm has issued a booklet designed to show the role it plays in the design, engineering and installation of electroplating systems. The last page features some of their typical projects, on which full details are available on request.

Activated Carbon

Adsorbite Division, Barnebey-Cheney Co., Dept. MF, Cassady at E. 8th Ave., Columbus, O.

A new technical bulletin details the uses, advantages, requirements, specifications and characteristics of activated carbon in purification of liquids, decolorizing, filtration, and similar applications.

Designated Technical Bulletin No. 13, it describes nature, characteristics and applications of numerous sizes and types of both extra-hard granular and powdered absorbent activated carbons. Evaluation methods for determining relative suitability of

carbons are described, and schematic illustration of methods of industrial application are included. Also fully covered are descriptions and recommendations for most suitable types, sizes and grades of carbon for continuous-flow, batching, mixing, gravity-flow, pressure-flow, fixed bed and other combination applications.

Sprayed Metal Coatings

MW Protective Coatings Div., Metalweld, Inc., Dept. MF, Scotts Lane and Abbottsford Ave., Philadelphia 29, Pa.

An illustrated two-color, four-page bulletin on sprayed metal coatings for contamination and corrosion protection has been made available.

This bulletin gives considerable data on the application to processing equipment, storing and shipping containers, tanks, tank cars and food handling equipment.

It also discusses the combinations of vinyls, furans, phenolics, epoxys, silicones, Neoprenes and chlorinated rubber with sprayed metal.

Ventilating Fans

American Blower Corp., Dept. MF, Detroit 32, Mich.

A new two-color illustrated four-page catalog (Bulletin No. 7214) describing Model B and Model E Ventura fans for commercial and industrial ventilation is now available.

The new catalog discusses features of the V-belt-driven fans and their application. Tables of performance data are included which list electrical power requirements, delivery ratings at different static pressures, fan speed, motor horsepower, nominal rotor diameter and net weight for each of the eight different sizes in each line.

Installation drawings are included in the new catalog giving basic dimensions for the fans.

Graphite Pipe, Fittings, and Valves

Falls Industries, Dept. MF, 31781 Aurora Rd., Solon, O.

A new twelve-page catalog covers the operating and dimensional specifications of Impervite, as well as diaphragm and custom-designed valves.

For comparative purpose, physical properties are charted for graphite, Impervite (resin impregnated graphite), and Graph-I-Tite (carbon-impregnated graphite).

This new catalog also contains a

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complete section entitled "Methods of Connection." It gives detailed instructions on how to cut threads, serrate and cement pipe in the field, using portable tools. Also, one section of the catalog covers maintenance and installation tips with special attention to thermal expansion, sub-assemblies, flexible couplings, and supports.

Finishing Zinc Base Die Castings

Frederic B. Stevens, Inc., Dept. MF, Detroit 16, Mich.

Technical Bulletin PP-125 on finishing of aluminum and zinc base die castings describes finishing recommendations made by the firm's customer service laboratory for many die cast items ranging from automotive door handles to camera range finders.

The recommendations which include type and size of buff or wheel, minimum number of operations required, wheel speed, necessary abrasives or compositions, etc. were culled from files of recommendations made to leading manufacturers.

The bulletin also explains how other manufacturers may avail themselves of the report services in determining methods and materials that would reduce finishing costs and improve final finish.

News from California

By Fred A. Herr



Certified Enameling, Inc., 1033 N. Mission Road, Los Angeles, is now under new ownership and, incidental to the change, has expanded facilities in the plant and added new facilities in the form of a second dip enameling plant at 1930 East 15th St.

The new head of the firm is *Cecil Lamm* who has been active in the baked enameling field for the past 15 years. *Gene Winekur* has been named general manager of the reorganized firm.

The present facilities on Mission Road, consisting of nine chemical, rinse and strip tanks for metal preparation will be increased by the installation of anodizing equipment. The plant

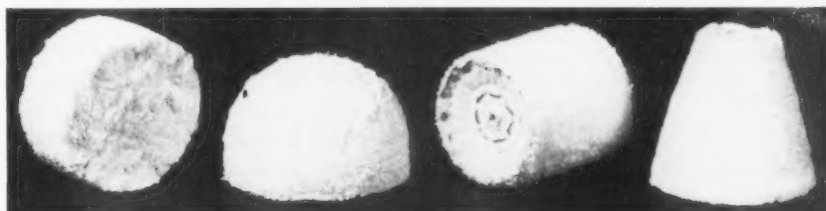
specializes in spray finishing by the latest conveyerized method. A mono-rail automatic setup and super-charged gas fired bake oven is used in the 15th St. enameling operations. The equipment is arranged for low cost, mass production work in phosphating, chromating caustic etc., magnesium treatment, hammertone, wrinkle, black wrought iron and novelty finishes.

The Braun Corp., industrial chemical and apparatus distributors, have moved from the east side industrial

district of Los Angeles, to a new 134,000 sq. ft. plant at 1363 South Bonnie Beach Place in the Banning area of the city.

The new facilities are designed for expeditious handling and storage of some 20,000 products of widely different types, ranging from delicate scientific instruments to carload lots of industrial chemicals. The plant includes unique vaults, open-air storage areas, and underground tanks for safe storage of solvents and other inflammable chemicals.

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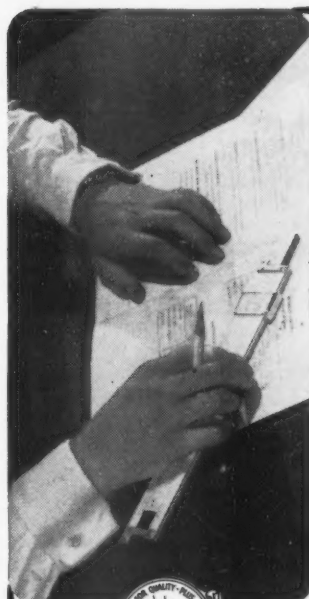
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The William R. Whittaker Co. of Los Angeles, manufacturers of aircraft valves, has purchased the 126,000 square foot factory formerly occupied by Grayson Controls, Inc., in Lynwood, Calif. Whittaker at present maintains administration and engineering facilities in Hollywood, and a production plant in Vernon, Calif. Engineering and manufacturing facilities, it is reported, will be consolidated in the Lynwood plant, which was vacated when Grayson Controls recently moved into a new plant in the North Long Beach area of Los Angeles County.

What is reported to be the first plant on the West Coast equipped to manufacture a full line of vitrified, organic and diamond grinding wheels is expected to be ready for opening by the Norton Co. of Worcester, Mass., at Santa Clara, Cal., late this year.

The company originally acquired the one-story building at 2555 Lafayette St., Santa Clara, 45 miles down the peninsula from San Francisco, for

warehousing west coast stocks of its grinding wheels. It was subsequently decided to convert the structure into a manufacturing plant in order to provide better service to the West Coast trade.

Renovation and equipping the building is reported to cost approximately one million dollars. The building contains 50,000 square feet of factory and office space, and is served by the Southern Pacific railroad.

Executive personnel of Norton's west coast plant includes the following in key positions: *George A. Garrison*, plant manager, who was formerly superintendent of packing and shipping at the Worcester main plant; *Lennert G. Jacobson*, office manager; *Duane Narnhart*, control engineer; *Martin T. Johnson*, foreman of finishing operations; and *Frederick H. Mattson*, foreman of mixing, molding and firing.

E. F. Houghton & Co. has appointed *John D. Bowden* as sales representa-



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tive in the San Francisco Bay area. A graduate in mechanical engineering from the University of Santa Clara (Calif.), Bowden has for the past three years, served as a production engineer for Food Machinery & Chemical Corp., at San Jose, Calif.

Walter F. McNaughton, who has been active in the production and sale of corrosion-resistant plastic tapes since 1948, has been named national sales manager for Plicoflex, Inc., with headquarters in Los Angeles. He was formerly assistant material control supervisor for the Dodge plant in Chicago, Ill.

Donald McGiffin has joined U. S. Spring & Bumper Co., Los Angeles, as foreman of the plating and buffing department at the main plant, 4951 Alcoa Ave. McGiffin, a graduate chemical engineer, had several years experience in plating with Standard Steel Spring Co. before joining U. S. Spring & Bumper.

The Extension Division, University

of California Los Angeles, is offering a night school course in the science and practice of electroplating which began September 13 and will be held one evening a week for 18 consecutive weeks at 708 Hillstreet Bldg. in downtown Los Angeles.

The present course is Part I of a two semester survey of the techniques and practices involved in plating. The instruction is designed for persons already active in plating and who wish to acquire a broader knowledge of the craft. All phases, including chemistry, plating and cleaning, polishing, and the preparation of various solutions, will be treated under the direction of instructor *Mitchell "Mike" Raskin*, factory manager of the Ajax Hardware Mfg. Co. of Los Angeles. Raskin has taught the plating class for a number of years.

Also available to platers who wish to add to their present knowledge of chemistry, or to acquire a basic understanding of the principles of chemistry, is a night school course in introductory chemistry. This course, which emphasizes the principles of chemistry and includes a brief intro-

duction to elementary organic chemistry, began September 13 and will be

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offered from 7 to 9:30 nightly for 18 weeks in the Chemical Building on the Westwood campus of the University of California at Los Angeles. The instructor is *Robert E. Ireland*, a UCLA research chemist.

John C. Mullarkey, formerly a contractor in Southern California, has been appointed technical service representative in the Phoenix, Ariz. area for Oakite Products, Inc., with headquarters in Phoenix. In preparation for the new post, Mullarkey recently completed an intensive training course at company headquarters in New York.

OBITUARIES

HERBERT J. FRENCH

Herbert J. French, vice-president of *The International Nickel Co., Inc.*, and assistant vice-president of *The International Nickel Co. of Canada, Ltd.*,

died August 17, 1955 in Rochester, Minn., after an extended illness. He was 62 years old.

An outstanding metallurgist, Mr. French was the recipient of many distinguished technical awards for his contributions to the science of metallurgy.

Mr. French joined International Nickel in 1929 as a member of the metallurgical staff at the company's research laboratory at Bayonne, New Jersey. Two years later he was transferred to the company's Development and Research Division in New York City and placed in charge of alloy steel and iron development. In September, 1943, he was appointed assistant manager of the division. Mr. French became vice-president of the company in March, 1947, and assistant vice-president of the Canadian affiliate in January, 1947.

Mr. French was a member and past president of the American Society for Metals, a member of the American Iron and Steel Institute, American Society for Testing Materials, and the

American Institute of Mining and Metallurgical Engineers. He was also a member of the Columbia University Club, City Midway and Engineers Club, all of New York.

Mr. French is survived by his widow, the former Louise H. Seibert, and one son, Dr. Ralph S. French.

DAVID CRAMPTON

David Crampton, chief chemical engineer of *Wallace & Tiernan Inc.*, was drowned on August 28th at Mantoloking, N. J. when caught in a heavy undertow.

Crampton had been with the company for twenty-four years, having entered their Development Engineering Department in 1931, following his graduation from Cornell University Engineering School. He held a number of patents in the field of water treatment, was a recognized authority in the refrigeration field, and supervised all engineering work at the company's chemical plants at Buffalo and Geneseo, N. Y., Dover, Ohio, and Belleville, N. J.

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500/250	6/12	Optimus
750/375	6/12	Excel
940	32	Elec. Prod.
1000/500	6/12	H-V-W
1500	13	Columbia
1500	30/50	Century
1500	40/65	G. E.
1500	70	Century
2000/1000	6/12	H-V-W
2500/1250	6/12	Elec. Prod.
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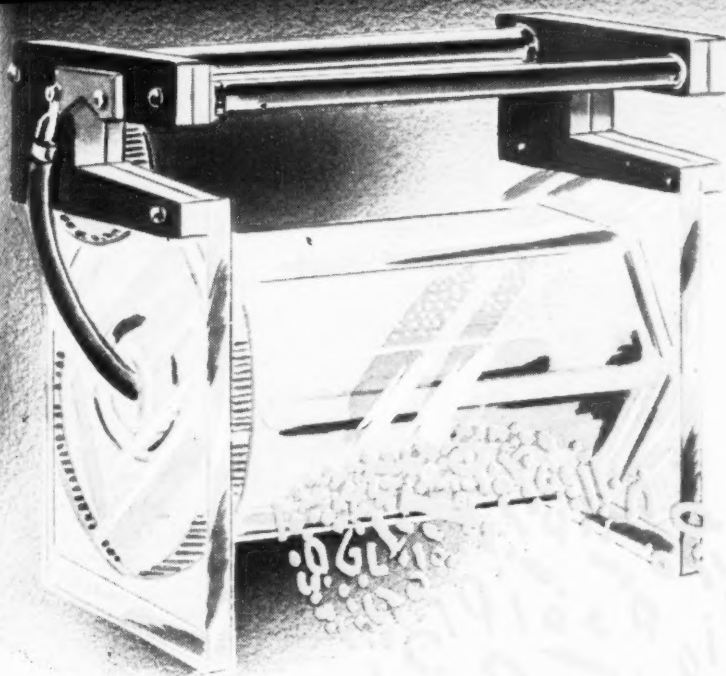
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